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ABSTRACT

This 21-paper collection examines various issues in electronic networking and conferencing with computers, including design issues, conferencing in education, electronic messaging, computer conferencing applications, social issues of computer conferencing, and distributed computer conferencing. In addition to a keynote address, "Computer Conferencing: More Than Electronic Mail," (Jacob Palme), the following papers are included: "Conversations: An Alternative to Memos and Conferences" (Larry L. Peterson and Douglas E. Comer); "User Friendliness at 300 Baud (The Cosy Approach to the Human Interface)" (Alastair Mayer); "On What the User Expects" (Richard Mason); "The Educational Application of Computer Conferencing for Teachers in Ontario" (Linda Harasim and E. Marcia Johnson); "The Structure of Message Sequences in Computer Conferences: A Comparative Case Study" (Margaret Ellis and Elaine McCreary); "Computer Conferencing: A Tool to Enhance Graduate Student Learning" (Madge Brochet); "Experiences with the Design and Implementation of the Envoy 100 Messaging System" (Irene Shumada); "Interconnecting Electronic Mail Systems: Interim Solutions from Bitnet and Mailnet Experiences" (Dan Oberst); "International Standards for Messaging" (Oskar Stubits); "Experiences with Electronic Message Networking" (D. Julian M. Davies); "Reactions of Scientists to the Structure and Contact of an International Computer-Based Conference (Jo Tombaugh); "The Blend Experiment: Computer Conferencing Communications within a Body of Scientists" (Peter Dodd); "Computers and Group Communications: The Law Forum Experiment" (Jennifer K. Bankier); "From Mail to Conferencing: Experiences of a Middle Management Group" (Ellen Pearson); "Group Productivity: Beyond Conferencing" (Tom Carey); "Social Psychology of Computer Communications" (Mike Lougee); "Social Psychology and the Design of Computer Conferencing Systems" (Warren Thorngate); "Some Preliminary Reflections on the Social and Human Aspects of Electronic Conferencing" (Ted Swart); "The Grand Conferencing System: A Distributed Network of Peer Server Machines" (Robert A. Flavin); and "Distributed Computer Conferencing--The GILT Project" (Jacob Palme). (LMM)

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Computer Conferencing and Electronic Messaging

University of Guelph
January 22 - 23, 1985

Conference Proceedings

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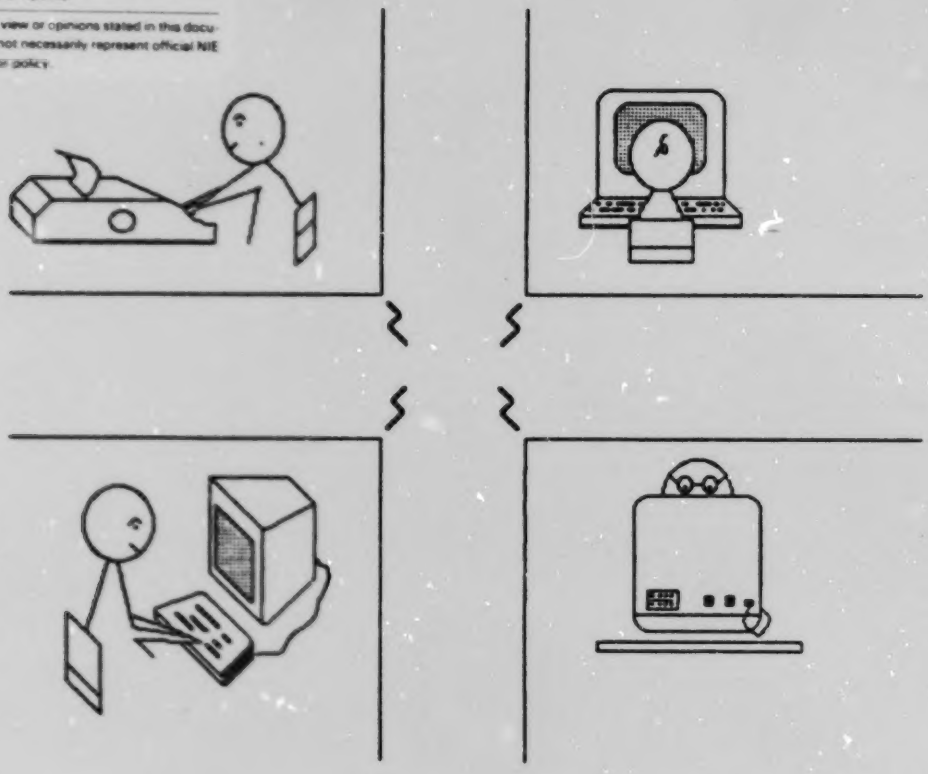

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Stockholm University
Computer Conferencing: More than Electronic Mail

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by Jacob Palme
Systems group

Computer Conferencing is more than Electronic Mail

All good computer conferencing systems are also good electronic mail systems. But computer conferencing systems provide something more:

> The receivers of information have better facilities for controlling the communication process and avoid the problems with information overload which occur with all large electronic mail systems.

> Computer conferencing helps to establish communication between people who are distant geographically or organizationally. Sociological studies show that such people are more successful.

> Computer conferencing is much better suitable to group communication. The communication is both very fast and efficient and also psychologically well suited to communication even in larger groups than are suitable for face-to-face meetings.

Functional differences between computer conferencing and electronic mail

Both electronic mail and computer conferencing is based on humans entering messages from computer terminals. Similar to both systems is also that the people communicating are rarely using the system at the same moment of time. This is an important difference from face-to-face meetings, where everyone has to meet at the same time.

In a pure electronic mail system, the sender of a messages enters from his/her terminal the names of those who are to receive the message. This facility is also present in computer conferencing systems. But messages in computer conferencing systems can also be sent to conferences. Messages sent to a conference are made available to (but not forced upon) all members of the conference. Conferences can be open (public) which means that anyone interested in the subject of the conference can join, or they can be closed, which means that the organizers of the conference decide who can take part in the conference.

Users of a computer conference system connect regularly, e.g. once a day to the system. They then read new letters to them and new messages in the conferences in which they participate.

For every user who is a member of a conference, the system keeps a counter of how far this user has read in the list of messages in this conference. The user is shown only new messages when connecting to the system. Users can however review old messages if they wish to do so.

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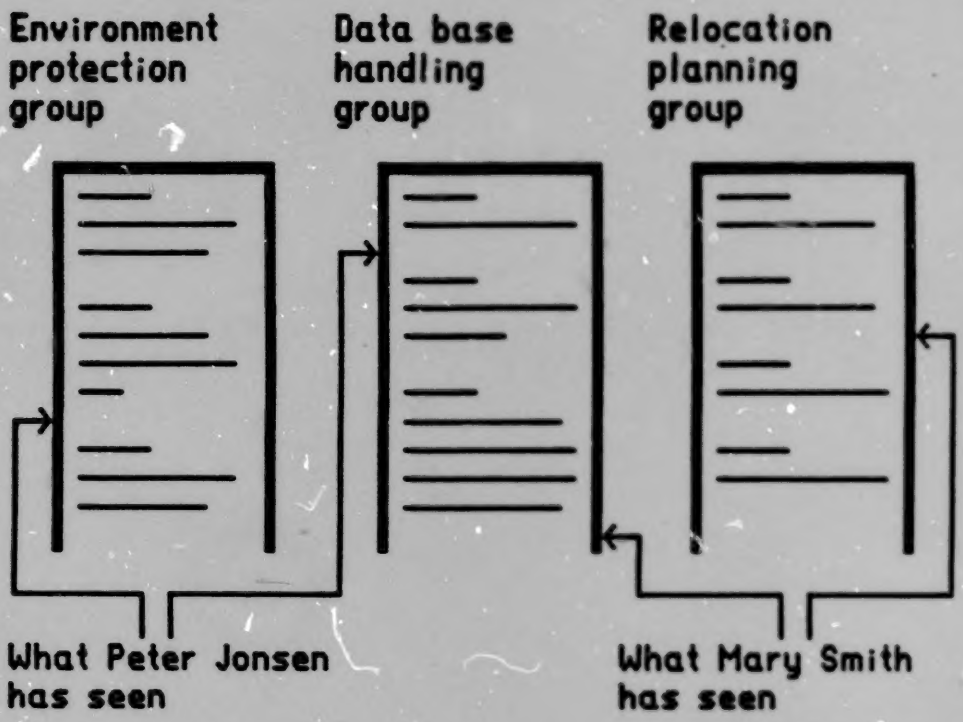
Environment protection group
Data base handling group
Relocation planning group
What Peter Jonsen has seen
What Mary Smith has seen

This figure shows the main principles of the news control facility in a computer conference system. In the figure, Peter Jonsen is a member of the first and second conference, and Mary Smith is a member of the second and third conference. There is a pointer in the data base for each person and each conference of which this person is a member. This pointer shows how far that person has read. Thus, users can enter the system at different times, and the system can show each user what is new to that user. If a user has been away for a few days, s/he will not miss anything. The number of entries below the marker will simply be larger than if a user connects more often.

Distribution of control

There are at least three parties involved in a communication process: The sender of a message, the receiver of a message and the organization using the communication system. More control for one of these three parties may mean less control for the other parties. A good computer conference system tries to achieve a balance of control between them. There is reason to believe that this will give a better communication process than a system where the communication process is too much controlled by one of the parties.

In a system where the communication process is too much controlled by the sender of the information, problems with information overload will for example often occur. This is the case with most electronic mail systems, where the sender of a message has almost all the control, deciding which people are to read the message sent.

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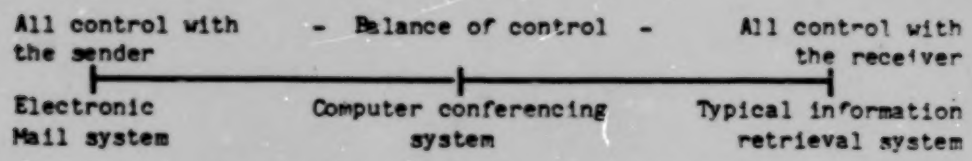
Computer Conferencing is more than Electronic Mail

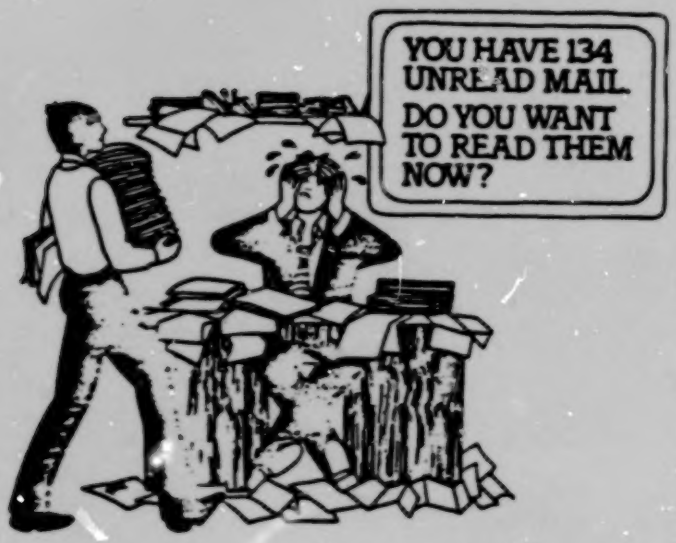

All control with the sender
- Balance of control -
All control with the receiver
Electronic Mail system
Computer conferencing system
Typical information retrieval system

This balance of control is achieved in the following way:

The sender of a message in a conference system can tell the system the names of one or more people who are to receive a message. In this case, the sender has full control of the receiver list. The receivers can send the message along to other people, but this is still a control from the sender, since the receiver now acts as a new sender.

92 % of all messages read in the COM computer conference system are however conference notices, not personally addressed letters. In this case, control is distributed between the sender, the receiver and the organizer. The sender decides to which conferences the message is sent. The organizer can remove messages from a conference which do not belong to the subject of the conference. For open conferences, the receiver decides which conferences to join. For closed meetings, the organizer decides who are allowed to participate, but a conference participant can always withdraw from a closed conference. The receiver decides the priority in which different conferences are to read.

Information overload



If all messages were sent from one person to one other person, information overload would very seldom occur, since the time to write a message is so much larger than the time to read that people would spend most of their time writing, and only a little time reading. With the advent of distribution lists, however, it becomes as easy to send a message to ten or a hundred or even more people than to send it to only one person. And the fact that computer mail systems make it so easy, through distribution lists, to send the same message to very many people, is the main cause of the information overload problem.

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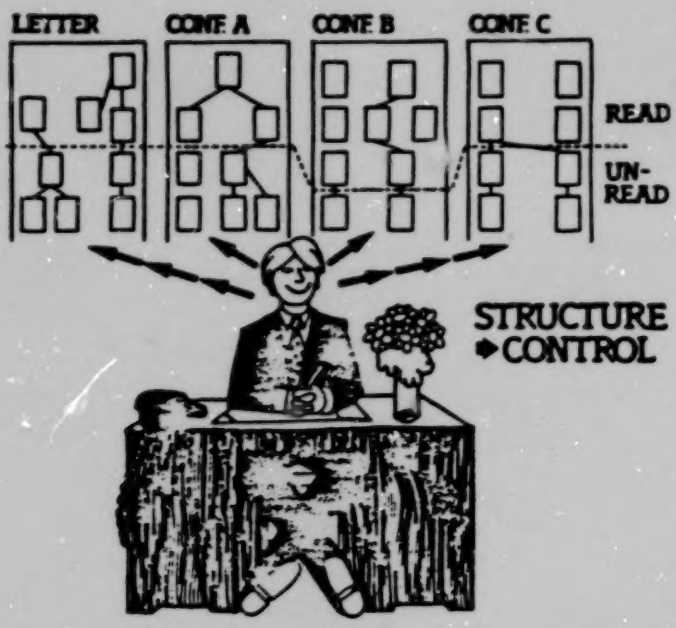
Computer Conferencing is more than Electronic Mail



When message systems grow larger, or get connected via networks, the audience you can reach with a message gets larger, the distribution lists get longer, and the information overload problems get worse.

To avoid information overload, a system must give the recipients of messages better ability to choose what they want to read and not to read.

Such structuring is achieved in computer conference systems, as is shown in this figure.

Messages are structured by conference, and within each conference some systems provide additional structure like the links between entries shown above. These structures can be used by the receivers to control what they will receive, and when.

More communication between distant people

This table shows how much of the communication in a large research institute using the COM computer conference system which went between people who were close and distant in the organization.

	Using the mail facility	Using the conference facility
Communication between people within one department	77 %	38 %
Communication between people in different departments	23 %	62 %

These results show that there is a difference between who communicates with whom using the mail and the conference facility in the system. The mail facility gives more communication between people who are close geographically or organizationally and who know each other well. The conference facility gives more communication between people who are far away and do not know each other. The reason for this is that the sender of a conference entry need not know the names of all the people who are to receive the entry.

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The reason why the reading time is shorter in the conference system is not only because people read faster than they listen, but also because a conference system allows every participant to decide how much time to spend on each message. You can read carefully items of importance and skip items with information you already know or which is of no interest to you.

This difference is not only an efficiency factor. It is also important psychologically. With twelve participants, as in the example above, every person uses about a third of his/her time giving information and about two thirds of the time receiving information, in the computer conference system. In an ordinary face-to-face meeting, they would on average talk 8 % of the time and listen 92 % of the time. Communication works psychologically better with computer conferencing, because you are not forced to be a passive listener as much as in face-to-face meetings. This also means that computer conferences can work well even in group sizes of 30-100 people which would be very difficult to manage in face-to-face meetings.

This fact is also one reason why people who regularly use computer conferencing systems feel that a whole new vista of contacts and communication has been opened for them. Group communication in large groups was simply not psychologically possible for them before, at least not so much in so little time as with computer conferencing.

The marginal cost of letting one person more take part in the communication is much lower with computer conferencing than with face-to-face meetings. This makes it economically possible to have larger group sizes, which means that more people can contribute with ideas and thus improves the quality of the result.

Distribution lists

Some electronic mail systems have distribution lists. You can send a message to a distribution list, and it will then be sent to all people on the distribution list. Note that this is not at all the same thing as computer conferencing. Much use of such distribution lists will cause severe information overload problems, while computer conference systems provide a way of solving this problem. The importance with computer conferencing is not only that messages can be sent to a group of people, but also that the receivers can decide which conference to take part in, and in which order to read news in different conferences.

The COM and PORTACOM systems

COM and PORTACOM™ are two functionally similar computer conferencing systems. Basic principles of COM and PORTACOM is to base the systems on a very general-purpose basic data base structure. On top of this general-purpose data base structure is built a user interface which is designed to be both very easy to use for the beginner and very powerful for the advanced user at the same time.

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Computer Conferencing is more than Electronic Mail

A computer conference system provides an environment where people can "meet" and exchange ideas much more freely than in a mail system. Contacts between people who did not know each other before are much easier to establish in a conference system than in a mail system. A conference system will much more easily provide cooperation and a feeling of togetherness between widely dispersed people. People who regularly use computer conferencing say that a whole new dimension of contacts and communication has opened up for them, and that they cannot understand how they were able to live in the seclusion before they started using the conference system.

What then, is the effect of the increased number of contacts at large organizational and geographical distances, which computer conference systems give. This has been studied in sociological research. This research shows that people having such contacts are more successful. They tend to be less conservative, they will easier accept new ideas and they are less prone to get stuck with bad or suboptimal solutions to their problems.

Larger groups work better

The figure below shows an important difference between computer conferencing and ordinary face-to-face meetings. The figure illustrates a group of 12 people communicating.

Conference system: Longer writing time but shorter reading time

Writing 3.6 min. | Reading 11 times 0.47 = 5.2 minutes. | Total time 3.6 + 5.2 = 8.8 minutes.

Ordinary meeting: You talk faster than you write, but you listen slower than you read:

Total time for talking and listening: 12 times 1.7 = 20.4 minutes.

Communication through a computer conference system is thus more efficient with time. If the time and cost of travel is included, the conference system is of course even more efficient. Studies on the COM computer conference system shows that if the same communication which takes place in COM would be performed through face-to-face meetings, the cost would be more than ten times larger. This estimate includes both travel costs, computer system costs and the value of the time of the people who use the system.

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Most standards for interconnecting mail systems provide only two functions, a SEND-MAIL and a NAME-SERVER function. GILT defines many more functions, for example the establishment of a parallel conference at several computer sites with automatic exchange of messages and the facility for one system to read messages from the data base of another system.

References

FOA reports below can be ordered from Rapportcentralen, FOA 1, Box 27322, S-102 54 Stockholm, Sweden. QZ reports can be ordered from QZ, Box 27322, S-102 54 Stockholm, Sweden.

Information about the availability of the COM and PORTACOM computer conference systems can be obtained from the QZ Computer Centre, Box 27322, S-102 54 Stockholm, Sweden, phone +46-8-67 92 80. In North America, information is also available from Dan Oberst at Edunet, P.O. Box 364, Princeton, New Jersey 08540, phone (609) 734-1915. The systems are available both for installation on your own computer and for use through international computer networks (EURONET, DATEX-P, TELENET, TYMNET etc.) links to QZ in Sweden.

Experience with the Use of the COM Computerized Conferencing System, by Jacob Palme, FOA Report C 10166E, December 1981.

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Studies of Computer Mediated Communications Systems: A Synthesis of the Findings, by Starr Roxanne Hiltz and Elaine B. Kerr. New Jersey Institute of Technology, August 1981.

The effects of formal Human Leadership and Computer-Generated Decision Aids on Problem Solving via Computer, by Starr Roxanne Hiltz, Kenneth Jonson and Murray Turoff, New Jersey Institute of Technology, December 1982.

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The data base consists of one area storing entry texts, one area storing users and conferences, and one area storing links between the texts, users and conferences. A text can be sent to any number of users or conferences by establishing links between the text and the receivers, a user can become a member of a conference by establishing a link between the user and the conference.

The user interface uses a combination of menus and commands. Novice users are guided by menus, but any command to the system can actually be given at any menu, and the menu alternatives are actually only a selection of the system commands. In this way, the system is easy to use for beginners because of the menus, but powerful for the advanced users since any command can be given at any time.

COM was originally developed for the DECsystem-10 and DECsystem-20 computers. PORTACOM is a portable version of COM, written in Pascal, and its development is financed jointly by nine European countries. PORTACOM is presently (October 1984) running on Univac 1100, VAX-11/VMS, IBM/MVS and IBM/VM computers, and version are also developed for Norsk Data Nord-100, IBM/VSI, Burroughs 7800, Siemens B-2000 and Control Data Cyber. Implementations on 32-bit micros, VAX-11/Unix and other computers are also planned.

Interconnection of conference systems

An important property of some mail systems is that many mail systems on different computers can be linked together, so that you can send messages from one computer to another. This will allow a person to read and write all his mail on one single computer, instead of having to log in to many different computers.

Some computer conference systems provide similar facilities. Mail will then be handled similarly to with inter-linked mail systems, and conferences can be run in parallel between many computers, with each entry sent to all computers where a parallel copy of the conference exists. A full copy of the conference is thus kept on all sites where they have one participant.

Users of mail systems can also participate in conferences, the conference will then look like a mailing list to them, sending them the entries as mail messages.

COM has had facilities for interlinking COM systems, both for mail and conferences, since 1979. COM can today (1984) communicate in this way using the RFC821/822 mail protocols used by ARPANET, MAILNET, CSNET, JANET etc. Such facilities will be developed also for PortaCOM, and COM and PortaCOM will also get support for the CCITT X.400 (MHS) protocols for interlinking mail systems.

The joint European project GILT (comprising 9 European countries) has developed a protocol for interlinking mail and conference systems which has better facilities for interlinking conference systems than the RFC821/822 and the CCITT X.400 protocols.

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Design Issues

Session Chairman - Robert Linebarger, Brigham Young University

Larry L. Peterson and Douglas E. Comer
Computer Science Dept. - Purdue University
Conversations: An Alternative to Memos and Conferences

Alastair Mayer
Institute of Computer Science - University of Guelph
User Friendliness at 300 baud - The Cosy Approach to Computer Conferencing Human Interface Design

Richard Mason
Institute of Computer Science - University of Guelph
On What the User Expects

Conversations: An Alternative to Memos and Conferences[†]

Douglas E. Comer
Larry L. Peterson
Purdue University

Workshop on Computer Conferencing and Electronic Messaging
University of Guelph, Guelph, Canada
Jauary 22-23, 1985

ABSTRACT

We present an overview of a computer mail system based upon *conversations* among individuals, and we illustrate how conversations support various communication paradigms, including memo-based communications, distribution lists, teleconferencing, and electronic journals. A conversation-based system groups messages into conversations, with messages within a conversation ordered according to of the *context* in which they were written. The context in which messages are written defines a relation between messages that leads to an efficient implementation of conversations in a distributed environment.

1. INTRODUCTION

Computer mail — the exchange of messages among computer users — has gained acceptance as a popular medium for communication among individuals; it offers the advantages of written communication at electronic speeds, while remaining less expensive than telephone communication. Several forms of computer message systems exist, ranging from conventional memo-based mail to teleconferencing systems. This paper describes a new mail system, and compares it to existing systems.

1.1 Conventional Mail

We conceptually view the conventional computer mail service in the following manner. A user, called a *sender*, first composes a message assisted by a *user interface*. The user interface then submits the message to the *message transport system* for delivery to a *recipient* user (or a *group* of recipients). The transport system, which may span one or more computers, deposits the message in the recipient's *mailbox* where it remains until accessed. When executed by the recipient, the user interface retrieves the queue of messages and displays a brief summary of each component message

[†]This work is supported in part by grants from the National Science Foundation (MCS-8219178), and SUN Microsystems Incorporated.

The user then selects a single message for displaying. After viewing a given message, the user can either save or delete the message, as well as generate a reply.

User interfaces differ in the way they archive messages. Simple interfaces, such as the UNIX mail [13], place saved messages in a named file. Other interfaces like MH [3], MS [7], and Laurel [4], provide more advanced mechanisms for archiving messages that the user wishes to save. Users define categories of messages, usually called *folders*, into which messages are filed. Further commands allow the user to browse through the hierarchy of saved messages, and to search for particular messages based on a specified attribute-value pair. User interfaces like EDMAS [2] and AUGMENT [14] provide a second mechanism for accessing related messages by *linking* together messages designated as replies to previous messages. The user is then able to traverse through the list of related messages.

Despite their differences, conventional user interfaces are all founded on a *memo-based* model, similar to the conventional office practice of memo communication. The interface treats each electronic memo that arrives independently from all other memos, and displays memos in the order in which they arrive. The user must observe any relationships that may exist between memos, since the user interface only assists in managing memos after they have been read.

1.2 Teleconferencing Systems

In addition to the conventional memo-based model for mail, systems like FORUM [11], COM/PortaCOM [12], and Network-News [8], support the exchange of information among users based on a *teleconferencing* model. Rather than sending a memo to a set of recipients, users *contribute* messages to *conferences* of which they are a *member*. All members of a conference may then view the messages contributed to the conference. Many teleconferening systems also often allow a sequence of messages and replies to be linked together within a conference.

A limited teleconferencing service called a Bulletin-Board (for example *UNIX msgs* [9]), provides a single conference for all users on a computer system. Users post notices on the bulletin board that all other users on the system are then able to read.

1.3 Discussion

The underlying structure that supports the memo-based system and the teleconferencing-based system is the mailbox and the conference, respectively. In both cases, the interface treats messages in a First-In-First-Out manner by appending new messages to the end of the structure and retrieving messages for viewing from the beginning. Thus, the order in which users see messages depends on the order in which they arrive at the mailbox or conference.

In this paper, we develop a new model for exchanging information that combines both the memo-based model and the teleconferencing-based model. Our approach replaces the First-In-First-Out ordering of memos with a mechanism that groups messages into conversations, and orders the messages within a conversation according to the context in which they are created. The next section presents an overview of the fundamental components of conversation-based mail. Section 3 then compares conversation-based mail with memo and conference based systems. Finally, Section 4 draws conclusions from our discussion.

2. CONVERSATIONS

The objective of a message system is to present the information contained in messages to users in an easily digestible and comprehendable manner, and to provide tools for message management. Specifically, the system should remove irrelevant messages, group related messages together, and present messages to the user in a meaningful order. The system should also support uniform access to all forms of mail-like services. Finally, the system should support a powerful archiving mechanism that allows individuals to easily retrieve old messages.

We now describe a new approach to computer mail that places a high-level structure on messages, where the fundamental object of communication is the *conversation* rather than the memo. Instead of reading, writing, and filing individual memos, users participate in a set of conversations. (For a complete description of conversation-based mail, see [5].)

2.1 Underlying Model

A conversation consists of a group of *messages*, denoted $M = \{m_i \mid i>0\}$, shared by a set of *participants*, denoted $P = \{p_i \mid i>0\}$. Also associated with each conversation is a *topic* defined by the user that starts the conversation. A topic is a short phrase that describes the conversation's general area of discussion.

Participants *view* the messages associated with the conversation, as well as add new messages. Thus, we take the view that participants *submit* messages to a specific conversation rather than mail them to a set of recipients. A conversation begins when a user defines the set of participants P and submits an initial message m_0. New members are added to a conversation by having the list expanded to include them. Similarly, old members may be removed. Being added to a conversation means having access to the entire *history* of the conversation (i.e. all of set M). Removal implies not being able to read any future messages submitted to the conversation. The system also allows users to manipulate entire conversations; a user can *delete* an unwanted conversation, as well as *merge* together two related conversations, and *split* a diverging conversation.

The conversation-based mail system partitions the messages in a conversation into *visible* and *hidden* subsets. The system automatically displays visible messages to participants when a conversation is viewed. (The system maintains hidden messages in the history of the conversation, and allows users to examine them with special commands.) Participants may *hide* messages determined to be irrelevant to the conversation, as well as *supersede* a group of messages with a single summarizing message.

The individual messages in a conversation consist of a *header*, a *body*, and a set of *attachments*. The header contains information about the message: the *sender* of the message, the *date* the message was created, and the *subject* of the message. The header may also contain a set of *parameters*, including the *urgency* and *lifetime* of the message. The body of a message contains the lines of text meant to be viewed by the conversation's participants. Along with the information contained in the body of a message, the sender may include a set of attachments with the message. Attached files like binary programs, source programs, and data files, are not necessarily meant to be viewed by participants. Instead, participants remove attachments from the message, and place them in files for further computation.

We classify the participants in a conversation according to the privileges they have. By default, all participants are granted the right to read the component messages of a conversation. A participant that is only allowed to read the messages in a conversation is said to be a *reader*. If the participant also has the right to submit new messages into a conversation, the participant is considered a *contributor*. Certain participants, called *administrators*, are granted the right to affect conversations in ways other than by submitting new messages. For example, they may add and remove participants, as well as move irrelevant messages into the set of hidden messages. Finally, the participant that starts a conversation is called the *owner* of the conversation. Besides having administrative authority, the owner has the right to extend and restrict the privileges of other participants.

The underlying structure of a conversation maintains the relationship among the messages which make up the conversation. Informally, when a participant composes a message, he does so in the context of the messages he has already seen. Specifically, *message context* is a relation $\mathbb{R}$ that holds between messages i and j, such that $m_i \; \mathbb{R} \; m_j$ if and only if m_i had been read by the author of m_j before composing m_j.

We represent the set of message context relations for the messages in a conversation with a directed acyclic graph called a *context graph*, denoted $G = (M, E)$. The vertices of G correspond to the messages in the conversation, while the edges of the graph represent the message context relation. An edge leading from node i to node j implies $m_i \; \mathbb{R} \; m_j$, and reads "m_i precedes m_j". Figure 1 gives an example of a context graph for a conversation in which message a was the initial message of the conversation. Messages b and c were submitted after their respective authors had read message a, but independent of each other. Message d was submitted after its author had viewed messages a and c, but before he had viewed message b.

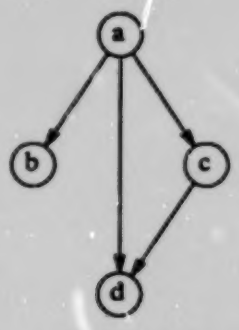

Figure 1
Example Context Graph

Associated with each participant p_i is a subset of M, denoted $\overline{M}_i$, corresponding to those messages in M already viewed by p_i. We informally think of the context graph as having each node marked according to whether or not each participant has read it. Thus, when participant p_i views a message, the message is added to $\overline{M}_i$, and when p_i submits a message, it is connected to the context graph by edges leading from all the vertices in $\overline{M}_i$. The messages in the graph are ordered by a topological sort [10] when displayed to a user. Thus, if message m_j was composed by a participant after reading message m_i, then m_i is displayed to those viewing the conversation before m_j.

Finally, at any time, a given user participates in a set of conversations, denoted $K = \{k_i \mid i \geq 0\}$. The user defines subsets of K by supplying a *subset name* and specifying the conversations in K

contained in the subset. (We represent the subset named S as K_S.) Defining subsets of conversations allows the user to treat a group of conversations collectively.

In addition to user defined subsets of K, conversation-based mail maintains a collection of system defined subsets. For example, the system partitions K into *foreground* and *background* subsets, denoted K_F and K_B respectively. Conversation $k_i \in K_F$ if and only if a participant has acted on it in the last n days, where n is a parameter of the system. K_B contains conversations that have been idle for n days. The system also partitions K into the subset of conversations that contain messages not yet seen by the user, denoted K_N, and the subset of conversations in which the user is up-to-date, denoted K_C. Finally, K_U denotes the set of conversations containing unread urgent messages. $K_U \subseteq K_N$, but $K_N \not\subseteq K_F$ because conversations move into the background after n idle days, whether a participant has viewed all of the messages it contains or not.

2.2 Implementation in a Distributed System

Although we abstractly view a conversation as having a single context graph G, because users expect a fast response time when viewing messages, a single graph is not practical if the participants in a conversation are distributed over more than one computer system and communication delays between systems are significant. Thus, we view each participant p_i as having a resident copy of a subgraph of G, denoted G_i, that is quickly accessible for viewing.

When participant p_i views the messages in a conversation, he sees only those messages contained in G_i, where $M_i \subseteq M$ is the set of messages resident at p_i's system, and $M_i \subseteq M_i$. Furthermore, when p_i submits a message, that message is added to G_i and the system propagates the update to all the other participant's copies to effect the change to G previously described.

Specifically, when p_i submits message m_{new} to a conversation, a new node is first attached to his graph G_i, and then to each remote copy of G. Updating a graph that physically reside at a remote location involves transporting information over computer networks. Because of varying communication delays between computers, however, it is possible for p_i to receive a message, read it, and respond to it before p_j receives the original message. Thus, we must insure that all the nodes to which m_{new} connects are also present in G_j. That is, the operation of adding m_{new} to a given G_j is blocked until each node that precedes m_{new} is present in G_j. Finally, because a path from each message that preceedes m_{new} is sufficient (rather than a direct edge), we require that the new message be attached only to the the *leaf* vertices of M_i, thereby reducing the overhead of adding new nodes to a context graph.

2.3 Prototype

Finally, we describe a prototype conversation-based mail system, called *DRAGONMAIL*, that is being designed as part of the TILDE project at Purdue [6]. *DRAGONMAIL* currently serves over 100 users and a dozen groups in the Computer Sciences Department, and is configured to run on three VAX/UNIX 4.2BSD computers, connected by a 10 megabit token ring. The *DRAGONMAIL* source is written in *C* and is approximately 6500 lines long. The binary occupies 21K bytes of memory.

DRAGONMAIL's user population is distributed over the three hosts, with a particular host designated as each user's *home* machine. On each host, *DRAGONMAIL* maintains a single copy of each conversation that a resident of the host is a participant in. That is, a single copy of the context graph is

replicated on each host that serves as the home machine for the participants in a conversation.

When the user invokes an operation that alters a conversation, the local version of *DRAGONMAIL* distributes the change to the home machine of each participant. *DRAGONMAIL* at each destination host then makes the appropriate changes to its copy of the conversation. Information is distributed between copies of a conversation through the existing mail transport mechanism; i.e. messages are deposited with SENDMAIL [1]. We chose to implement *DRAGONMAIL* on top of the existing message transport system because it allows peer *DRAGONMAILs* to communicate over a large mail system in which the component hosts do not share a common transport level protocol.

The sending *DRAGONMAIL* encapsulates the message and header lines inside of a standard message (i.e. it adds *DRAGONMAIL* specific header lines to the regular header, and places other data in the body.) When a message arrives at a remote copy of the conversation, the local *DRAGONMAIL* updates its copy of the context graph associated with a conversation. If the message cannot be added to the local copy of G because the messages that precede it are not present, then the message is placed in a queue. As additional messages arrive, *DRAGONMAIL* checks the queue for messages that can be added to G. Because the message transport mechanism occasionally loses messages, queued messages *timeout* after a period of time, and the local copy of the conversation is refreshed by requesting the conversation's history from the conversation's home host (home of the conversation's owner).

3. ANALYSIS

As mentioned in Section 2, conversations provide the fundamental object of communication in conversation-based mail, with each conversation concentrating on a specified topic. The way in which users employ conversations, and the extent to which participants limit the scope of a conversation, however, is unrestricted. In this section, we explore how conversation-based mail supports several communication paradigms, including conventional models of message communication.

3.1 Memo-Based Mail

The degenerate case of conversation-based mail (with $M = \{memo\}$ and P defined as the recipients of the memo), is the same as memo-based mail. A user starts a new conversation by sending an initial message; if the other participants send replies in separate conversations, a set of independent conversations equivalent to the set of independent memos generated by memo-based systems results. By grouping related, single-message conversations together into a set, users are able to simulate folders supported by many conventional user interfaces.

Conversation-based mail augments the memo-based model by allowing users to submit related messages into a single conversation. The context graph of the conversation, G, maintains the relationship among the messages in the conversation in a manner similar to the chain of replies supported by some memo-based systems. Let $C = (M, R)$ be a directed acyclic graph that represent a reply chain, where the set of vertices M represent the messages in the chain, and the edge $\langle m_i, m_j \rangle \in R$ if and only if message m_j is a reply to message m_i. If we assume C and G contain the same set of messages M, then C is a subgraph of G since if $(m_i, m_j) \in R$ then the author of m_j read m_i before composing m_j, and $m_i \; \mathbb{R} \; m_j$ is true. G also contains the edge (m_k, m_l) for all messages m_k and m_l

such that message m_k precedes message m_i, but m_i is not a reply to m_k.

3.2 Distribution Lists and News Groups

Conversation-based mail also supports a communication paradigm in which a conversation is equivalent to a mailing list or news group. Let L represent the set of users in a distribution list (or the set of users that read a particular news group). Whereas users in conventional mail systems send messages to L, the participants in conversation-based mail submit messages to a conversation with participant set $P = L$.

The distribution list paradigm can be characterized by the large scope of the topic discussed by the group. That is, such groups generally discuss broad topics consisting of several more limited sub-topics. For example, a mailing list named *Mail-People* might investigate computer mail in general, but at any given time may discuss such topics as the syntax of header lines, *UUCP*-style addresses, and the relative merits of a particular user interface.

Conversation-based mail provides a mechanism that allows users to manage each of the threads of conversation that run through a large discussion group as a separate conversation, while maintaining the connectivity of the entire group. Let K_L be a set of conversations such that each conversation $k_i \in K_L$ contains one topic discussed by the distribution list L, and $P^i = L$ for each k_i. For example, the individual members of the group *Mail-People* might be the participants in three separate conversations: one discussing header lines, one discussing *UUCP* addresses, and one discussinging a particular user interface. $K_{Mail-People}$ is the set of conversations that is equivalent to the distribution list *Mail-People*.

Because each user is free to define his or her own conversations sets, K_L is not limited to contain only conversations with $P = L$; it may contain other related conversations as well. Similarly, any conversation $k_i \in K_L$ may also be a member of another conversation set. Finally, each user is free to remove any conversation in which he or she is not interested from K_L.

3.3 Teleconferencing-Based Model

As mentioned in Section 1, teleconferencing-based message systems offer an alternative to the memo-based model by allowing *members* to belong to *conferences*. The teleconferencing model is similar to conversation-based mail, because each conference is analogous to a conversation, where the members of the conference define the conversation's participant set.

One significant attribute of the teleconferencing-based approach is that a conference may branch into a collection of *sub-conferences*. Each member of the conference follows the sub-conference branches in which he or she is interested. Conversation-based mail supports a similar communication paradigm. Let $K_T = \{k_i\}$ be a conversation set that is equivalent to a new conference. The forking of a conference into two sub-conferences is equivalent to splitting conversation k_i into k_{i_1} and k_{i_2}. Both new conversations contain the messages submitted to the original conversation, and both are members of K_T. The participants in the resulting set of conversations may select only interesting conversations for further consideration, as well as manipulate K_T to suit their own tastes.

In addition, conversations (branches) can be merged together, and irrelevant conversations can be deleted — an action analogous to branch pruning. Finally, because starting a conversation is as easy as sending a memo, new conferences are easy to start.

3.4 Electronic Journals

Conversation-based mail's participant classification scheme supports a *journal* or *magazine* paradigm. The contributors in a conversation are the *writers* in the journal; they submit *articles* to the journal. Administrators act as *editors* by bidding irrelevant and inappropriate articles. The readers in the conversation comprise the *subscribers* to the journal. They may read the articles in the journal, but may not submit contributions of their own.

3.5 Approximating Conversations

We conclude this section by discussing a related topic: approximating conversations in conventional mail. In other words, because conventional mail systems coexist with conversation-based mail, it is necessary to present a conversation-like interface to all mail services.

In the case of memo-based mail, each user defines how arriving memos should be grouped into conversations. That is, the user defines a mapping of information contained in the memo header, into a corresponding conversation where key header lines include the **To** line, the **From** line, and the **In-Reply-To** line. For example, all messages arriving for a given user addressed to a distribution list like *Mail-People* could be assigned to a single conversation, and all mail addressed to a role like *postmaster* could be assigned to another conversation. Similarly, users could isolate messages from a certain person or group of people into a conversation. Finally, all memos designated as a reply to another memo could be group into a conversation.

Teleconferencing systems and news groups naturally correspond to conversations. Thus, a given news group that a user subscribes to could be managed as a single conversation by the conversation-based mail interface. Note that only the interface to the news group would change. The underlying maintenance and transporting of news articles would still be handled by the news mechanism.

4. SUMMARY AND CONCLUSIONS

We have described a new high-level computer mail service based on conversations rather than independent memos. Conversations have the advantage of being more consistent with the way humans communicate. Conversation-based mail also supports various message exchange paradigms such as memo communication, mailing lists, and journals.

We developed a model for conversation-based mail that leads to an efficient implementation in a distributed environment, where the system maintains a resident context graph for each participant. Any changes in the conversation are then propagated to the component context graphs.

Conversation-based mail provides a viable alternative to existing computer message systems. Conversations are as powerful as teleconferencing systems in their ability to group related messages, while remaining as inexpensive to use (and start), as conventional memo-based systems. Conversation-based mail also supports a uniform interface to all forms of mail-like services. Most importantly, conversations provide a flexible communication paradigm that the user can tailor to his or her needs.

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User Friendliness at 300 Baud
(The COSY Approach to the Human Interface)

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ABSTRACT

The COSY Conference System was developed with ambitious design goals and interesting constraints vis-a-vis the "user interface". Among these were that it be learnable without recourse to a manual, and that it be "friendly" even over low-speed phone lines. The user interface can make or break the success of such a system, no matter how powerful the underlying architecture. This paper looks at the goals and constraints, and discusses how they were met in COSY.

INTRODUCTION

The initial success of a computer conferencing system, such as the COSY system developed at the University of Guelph, depends a great deal on how easy the system is to learn and to use -- the "user friendliness" of the system. (A mature system may have built up a rich enough base of interesting messages and users to perpetuate itself despite shortcomings of the user interface -- Usenet, for example.) Thanks to the success of such machines as the IBM PC, Commodore 64, and Apple Macintosh, the term "user friendly" often conjures up images of colour graphics, bit-mapped screens, "pop-up" (or pull-down) menus, icons, and electronic mice. However, the nature of a computer-based conferencing system, comprising textual data bases and requiring access from diverse sorts of terminals and communications equipment, renders such approaches impractical at best. Consider trying to use a system whose human interface is designed around manipulating icons on a graphic screen with a mouse, when all you have is a

"dumb" hardcopy terminal and a 300 baud modem!

"Ease of use" was the primary goal in the development of the COSY conferencing system (known also as "CONTACT" in preliminary documents). While the functional requirements were outlined in the original specifications [Mason83], the first task of the development team was to design an elegant user interface for a system comprising those functions. The primary goals of this interface design were:

(1) ease of learning, ideally without recourse to a manual

(2) ease of use, minimizing unnecessary typing

(3) not tedious; repetitive displays should be minimized (consider the user of a slow, hardcopy terminal as well as users of fast screen terminals)

(4) robustness, the system should insulate the user from the underlying operating system, and provide guidance in case of errors

Design Method

The implementation group was under severe time constraints to develop a working prototype of the system (less than three months, with only one person, this author, working full time on implementation). However, the human interface was rightly considered of sufficient importance that several weeks were spent designing it before coding was started. The method used was a series of brainstorming sessions to thrash out the user interface (and underlying architectural issues). A draft "User Manual" was prepared after each of these, and subsequent sessions would be based on revising and rewriting this manual. Finally, the User Manual was submitted to a designated "user group" for their consideration and comments. Several cycles of this occurred, until both users and implementors were happy with the user interface, at least on paper. (Readers interested in the details of this rapid prototyping from a software engineering standpoint should see [Mayer85]).

It was decided early on that the human interface NOT be dependent on menus. While a menu-driven system might satisfy point (2) above, it is not necessarily true that it is any better than a command-driven system at satisfying point (1), and totally violates the spirit of point (3). Further, command driven systems are inherently more flexible, and allow for such features as command files and command macros. The only comment the original specifications [Mason83] had on the subject was a reference to the COM/PORTACOM user interface design goals [Palme82]. These provide for a minimal, unnumbered menu for novice users which is essentially just a guideline; the system is command driven.

To avoid the repetition of even this minimal guide line, it

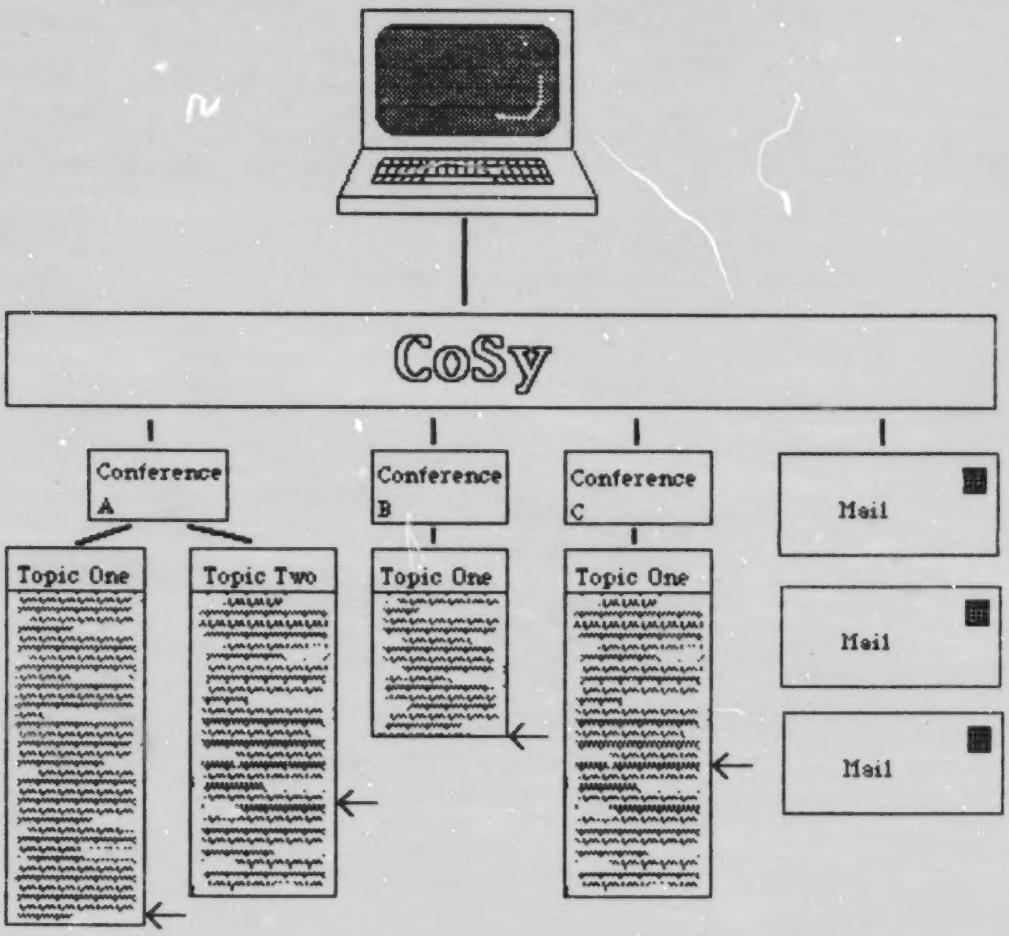

figure 1: **User's View of COSY**

A simple schematic representation of how the COSY user views his conference and mail files (user files, including the scratchpad, profile and resume files, are not shown). Conference and topic names may be up to 12 characters. Mail is stored internally in RFC-822 format, and there is a mail link with NETNORTH/BITNET.

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was decided to make the system easy to learn by minimizing the number of available commands. This limit was arbitrarily set at ten. It was this constraint that lead to COSY's more innovative features, and the average user rarely uses even half-a-dozen commands in a session, although the total number available is far more than ten.

General Conference Structure

To facilitate explanations of the user interface, it is useful at this point to describe the organization of information within COSY. This information can be separated into two classes: information about users, and information about conferences. (In reality, there is a third class: information about non-conference messages, i.e. mail).

As COSY is implemented on UNIX* use is made of the hierarchical or tree-structured file system, and organization of conference and user information is best viewed this way. All COSY users choose (or are given) a "nickname" which they use to log on with and which serves as a unique identifier for that user. There is a master table of all COSY users containing the user's real name and nickname, which any COSY user may access to determine the nickname of somebody else. There are also several files and attributes associated with each user. These are: an index of all conferences of which the user is a member, together with pointers to the "last read" message in each topic within the conferences; a "profile" file of COSY commands to be executed whenever the user logs on; a "resume" file containing the user's full name, address, and any sundry information the user may choose to put into it. The user "conference list" file is accessible only by COSY, while the "profile" and "resume" files may be edited by their owner. Any user may look at any other user's "resume" file; this mechanism associates an unfamiliar nickname with a real person.

A "conference" in COSY is a specific data structure, comprising information common to the whole conference (title, moderator, and member list) and one or more "topics" and their associated information (title and message text). Messages are stored in chronological order within a topic. Each message has header information associated with it, including a timestamp, the nickname of the author, and pointers showing which (if any) message it is a comment on, and which (if any) messages are comments on it. Thus, the messages within a conference can be viewed either as a simple, linear sequence, or as a tree structure based on whether a message is a new thought or a comment to a previous one.

There are three classes of conference: open, closed, and confidential. An "open" conference may be joined by any user on

*UNIX is a Trademark of Bell Laboratories.

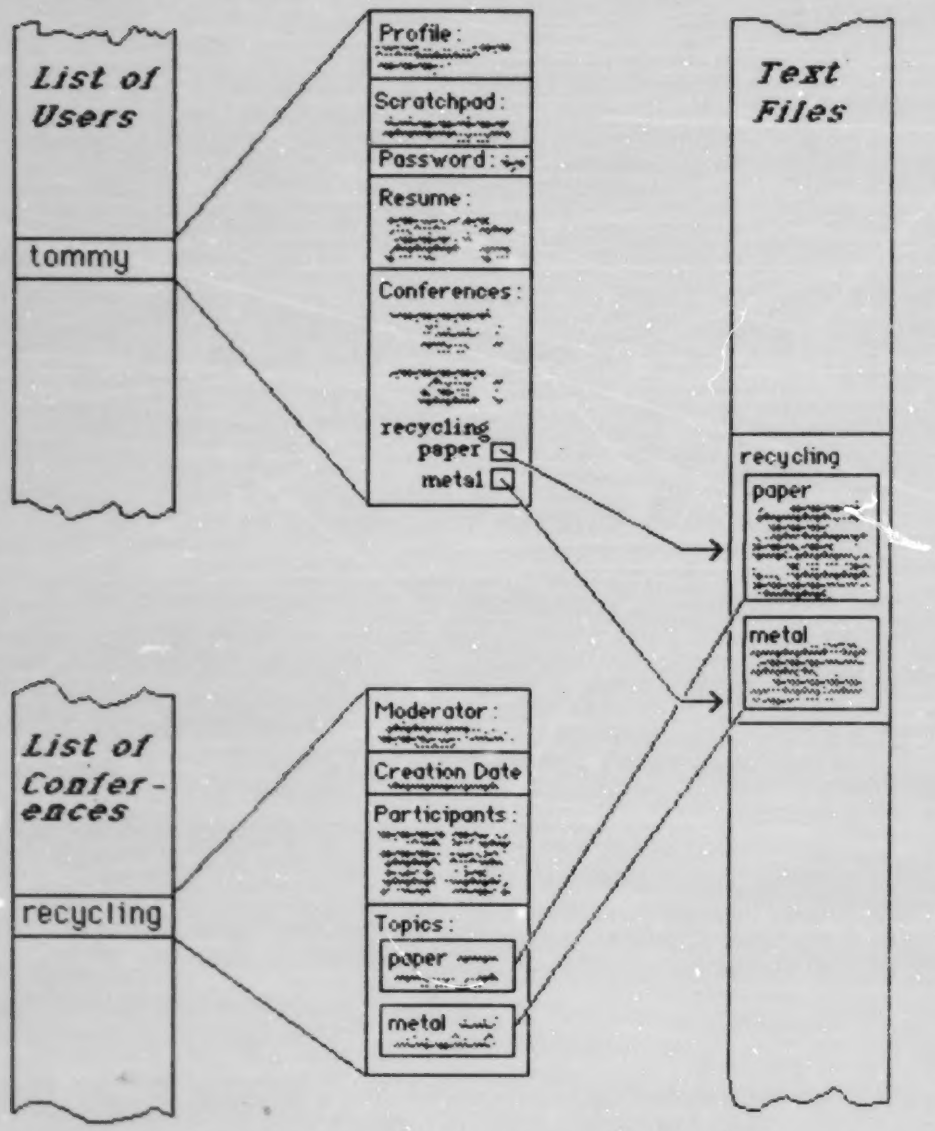

figure 2: System View of COSY

Schematic representation of COSY's view of the file system. In reality, use is made of the UNIX file system. For example, text files for individual topics are stored separately within a the directory of each conference, and a user's Scratchpad, Resume, and Profile are stored as separated files within a user's directory. Passwords are stored in encrypted form in /etc/passwd.

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the system, while closed conferences can only have participants who are explicitly added by the conference moderator (the user who created the conference initially). Both the names and brief descriptions of all open and closed conferences appear in a system-maintained list of conferences. Confidential conferences are also closed, in that they may be joined only through the actions of the moderator. Confidential conferences do not, however, appear on any list accessible by COSY users, and the existence of a given confidential conference is known only to its members. A fourth class of conference, "conversation", is really just a numbered confidential conference, but some additional facilities are built-in to COSY to simplify their use. This was the original non-conference messaging facility (NCMF) or mail system [Mayer84a], but since COSY 3.0 the term "mail" refers to a conventional messaging subsystem based on the ARPA Internet standard, RFC-822 [Crocker82, Mayer84c]. This latter subsystem also provides for message exchange over the NETNORTH and BITNET computer networks, and through them various other nets.

THE COSY USER INTERFACE

Command Entry

As already mentioned, a primary design requirement for COSY was ease-of-use by both novice and expert. It was also necessary that there be no special terminal hardware requirements: it must be usable from any ASCII terminal. To simplify use on slow hard-copy terminals, repetitious output (such as menus) is minimized, and reasonable defaults are taken with minimum input. Like the data structure, the command structure is also hierarchical, with additional commands organized into subsystems.

It is a common rule of thumb that a null input (just hitting <RETURN>) should cause a program to "do nothing". Often, however, the most probable desired action can be anticipated, and using the null input to signal that can save considerable typing by the user. This latter scheme is used in COSY, with the action being context sensitive. It is thus possible to read all one's unread messages by stepping through them using the <RETURN> key, with no other typing of commands. Simply stated, if the user is connected to a conference, <RETURN> causes COSY to display the next unread message in that conference; if there are no more unread messages in that conference, or the user is not connected to one, COSY will connect to the next conference in the user's personal list with any unread messages.

The user may of course choose to enter a command rather than just hitting <RETURN>. To reduce the amount of typing necessary, nearly all COSY commands may be abbreviated (the exceptions are infrequently used, special purpose commands). It is not

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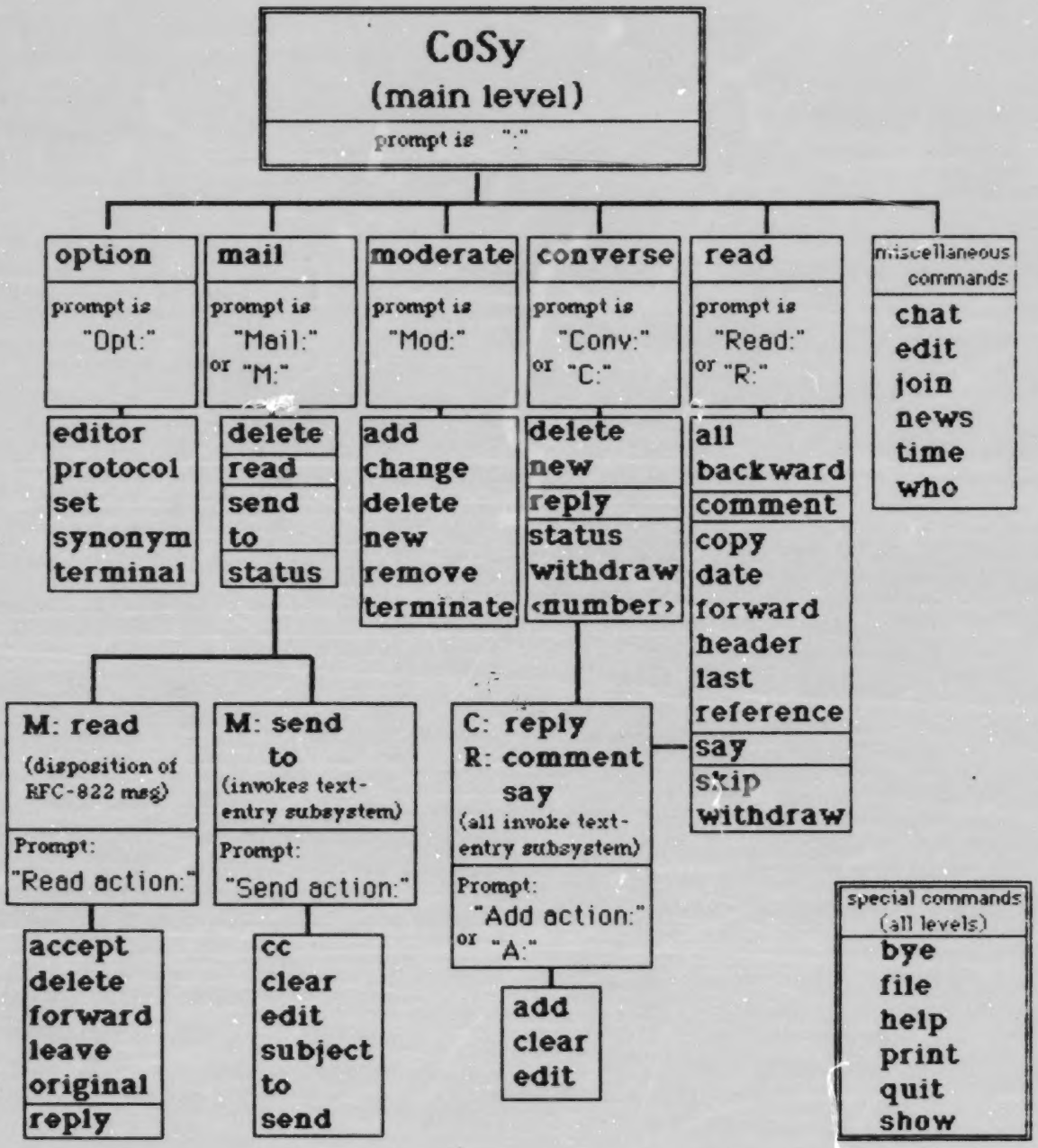

figure 3: COSY Command Structure

This shows the hierarchical nature of COSY commands. Not all commands and options are shown. In particular, in some contexts a conference name, mail or message number may be a valid "command". Users may define their own synonyms.

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necessary that the user remember special abbreviations, as COSY will accept any truncation of the full command word, down to a single letter. The command parser is aware of context (via a state variable), reducing the ambiguity of abbreviated commands. If an entry is ambiguous, COSY will list the possible interpretations. For example:

```
Read: s
Ambiguous entry.
Choices are: say, search, skip,
Read:
```

Much thought went into the original selection of command words. Any new commands are chosen carefully, in order to minimize potential collision of command abbreviations. Special care is taken to avoid the possibility that a new command might render a previous single-letter abbreviation ambiguous, although sometimes such a collision may be preferable to the otherwise farfetched synonym for the desired command!

If an unrecognizable entry is encountered, COSY will list the most frequently used commands relevant to the current context. Entering a question mark (?) (or the word "help") will result in a context-dependent "help" display. Another example:

```
Mod: zap
Unrecognized entry.
Choices are: add, change, help, new, quit, remove, terminate
Mod: ?
Enter one of:
              add.....add a participant or topic
              change.....change the title of a topic
              new.....create a new conference
              quit.....exit "moderate", return to main
              remove.....remove participant or empty topic
              terminate..make conference 'read-only'
Mod:
```

Help displays, stored as files for ease of maintenance, are available for all COSY commands and subsystems, and can be individually accessed if the user wishes to browse through them. The verbosity of prompts and status messages is controllable by the user via "terse" and "verbose" commands. (Not to be confused with the "quiet" and "verbose" versions of the text editor, described below). Users familiar with COSY may enter a sequence of commands on a single line, which COSY will interpret without further prompting. Otherwise, COSY provides a simple "ready for command" prompt that reminds the user of context (eg ":" is the main level prompt, "Read:" or "R:" is the read subsystem prompt, "Mail:" or "M:" is the mail prompt, etc.). Any specific information needed (a name, or answer to a yes/no question) is of course asked for specifically, unless supplied on the command line.

Users can redirect the output of a command by preceding it

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with the word "file" or "print", which cause the output to go to a "scratchpad" file or a printer spool file, respectively. Originally included to allow users to save messages (by filing them) and to obtain hardcopy, these options have been extended to allow the output of any command to be redirected.

Text Entry and Editing

Even the most elegant user interface in a conferencing system is useless unless it includes some method of entering conference messages. COSY provides each user with a "scratchpad" file for text preparation, the system then copies this file to the appropriate location. The COSY prototype simply invoked the UNIX editor ("ed" [Kernighan78]) to edit this scratchpad, including initial text entry. (The scratchpad was cleared after copying the contents to a conference message).

While the UNIX editor is powerful and not difficult to learn for those familiar with line oriented text editors, it is not friendly to naive users. Thus, a simple "verbose" text editor was written. Where possible, the verbose editor uses the same commands as the UNIX (or quiet) editor, although its power is limited. A menu-like prompt reminds the user of available commands. Users may choose either the verbose or quiet editor, experienced users preferring the quiet editor. Later development saw a new quiet editor being written. Identical to UNIX "ed" in most respects (but a little more friendly), it allowed us to port COSY from one system to another without worrying about vagaries of UNIX versions, and allowed us to prevent undesired escapes to UNIX and do some other customizing of the editor without requiring a UNIX source license. This was later extended by adding a "front-end" which duplicated the interface of the verbose editor, which not only resolved some annoying bugs in the verbose editor but allowed access to some of the more powerful functions of the quiet editor.

Up to this point, the method of adding messages to conferences was still an awkward point in the COSY user interface. The user would issue the appropriate command ("say" or "comment"), and COSY would invoke the text editor. This is best illustrated by example:

```
R: <cr>
demo/example #2, from al, 31 chars, Mon Jan 8 10:30:00 1985
----------
Is this really a demo message?

R: comm
Editing SCRATCHPAD
0
E:a
Yes, this is really a demo message.
E:w
36
E:q
Edit complete.
Comment to message number 2. Okay to add comment (y/n)? Y
Adding. Message 3 added.
Clear SCRATCHPAD (y/n)? Y
R:
```

The yes/no questions in the example illustrate default answers ("Y"), which allow the user to reply by merely hitting <RETURN>, but it is admitted that this awkwardness was not in line with the otherwise smooth flow of using COSY. Most user suggestions on this point revolved around adding additional commands to the text editor, to provide for updating the file, leaving the editor, adding the message, and clearing the scratchpad all at a single stroke. For various reasons, this struck me as the wrong way to go. Implementation difficulties aside (the editor runs as a separate process from the rest of COSY, so such a command would require some sort of interprocess communication) the text editor is also used for editing the user's "profile" and "resume", in which context such a command is meaningless.

This issue was resolved with COSY release 3, the current production version. The 'say" and "comment" commands no longer immediately invoke the text editor, unless the scratchpad is non-empty. Instead, the user is placed in a text-input mode identical to the "append" mode in the editor (either verbose or quiet, depending upon which the user normally uses). Again, an example is helpful:

```
R: <cr>
demo/example #2, from al, 31 chars, Mon Jan 8 10:30:00 1985
Comment(s).
----------
Is this really a demo message?
R: com
Comment to message number 2. Enter text. End with '.<CR>.'
Yes, I told you it was.
A: add
Adding. Message 4 added.
R:
```

On leaving this text input mode (which writes to the scratchpad), the user is in a "sub-subsystem" at which the user has command control. The usual command is "add", to add the scratchpad as a message to the current conference and clear the scratchpad. Other options at this point are "edit", to invoke the text editor to change or add to the scratchpad, "clear" to erase the scratchpad and return to the previous command level, and "quit" to return to the previous command level and leave the scratchpad alone. The advantage of this approach is that it meshes well with the general flavour of COSY, and provides for easy expansion in future; for example, a "spell" command could be added to check the spelling in the just-typed message before adding it to a conference.

SUMMARY

COSY has met with considerable success since its inception. The first prototype was up and running less than two years ago, and it is now a service offering of the University of Guelph with over 700 users around the world. Many of these users indeed learned COSY without the manual (although the a User Manual is available [COSY84] and should be read to get the most out of COSY). Since many of these users access COSY over phone lines and packet networks, and even the on-campus users often dial up from home or while travelling, user friendliness even at 300 baud has been an important component in COSY's success.

Our experience has shown that forethought and particular attention to the design of the human interface is vital to the success of such a system. Attention to user feedback has also been important. As mentioned, the User Manual, written before coding started, was subject to user feedback, and ever since the prototype was up and running there has been an open conference "cosy" with the topics "bugs", "wants", and "other" to solicit user views, complaints and suggestions. While user views on how a function should be implemented can (and sometimes should) be ignored (see above), user views that a function is necessary should not be.

Nor should facilities and features (bells and whistles) be added just because it is technically possible or even easy to do so. Adequate consideration must be given to how the user will interface with these features and what effect they might have on other aspects of the system. Indeed, the human interface is the pacing factor in COSY: there are several features that are possible, given the architecture of COSY and UNIX, that have remained unavailable to users, not because the feature itself is difficult to implement, but because the effort to build the human interface necessary for a feature's easy use is considered more than the

utility of a feature warrants. (Some such features are available to expert or system manager users, protected by a privilege level scheme). Thus, though COSY is flexible and powerful, there is nothing about it that is not easy to use.

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WHAT THE USER EXPECTS

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ABSTRACT

Users of any new computing facility often expect more than the facility is designed to provide. This paper classifies users, and discusses this problem of expectation in terms of user type, in the context of computer conferencing systems. The paper also discusses the relation between such systems and other office-type applications.

INTRODUCTION

This paper addresses issues of user expectation in relation to computer conferencing systems. The title of the paper, however, does not refer to computer conferencing. There are both general (computer science) and specific (computer conferencing) issues involved in "what the user expects". As a result, this paper is written from the perspective of the designer and developer (of computer conferencing systems), and not from the perspective of the user. The paper may be of more interest to users, as an indicator of the issues faced by systems designers, than as an instruction to the designer on what the user expects.

I will use examples from the computer conferencing system, CoSy, developed at the University of Guelph (1). At the time development of CoSy was undertaken, there was well-developed literature and a good deal of practical experience with computer conferencing systems of the type represented by CoSy. CoSy was undertaken initially as a prototype (as opposed to a product development on the one hand or a research investigation on the other) with the specific objective of attempting to do things better from the user perspective. This applied particularly to our desire to provide a facility which would be easy to use.

Of course, software engineers will recognize that no one ever specifies a system to be difficult to use. Ease-of-use thus expresses a general characteristic which requires translation in terms of an implemented system/human interface. The specifics of this translation are described elsewhere in these proceedings (2).

Amongst many system aspects which CoSy was not undertaken to achieve, was the construction of a system which would meet international communication standards. The academic community at the University of Guelph had, for many

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years, excellent access to and experience with electronic mail and messaging systems. The University's need for a computer conferencing system was clearly exposed by the difficulties experienced in communicating scholarly material of substance using systems designed for messaging alone. The problems of moving messages, files etc. from one location to another are not of interest to us; this is not to say they are not important to us, since it is obvious that CoSy builds upon a foundation of workable, practical, digital communications facilities.

This paper attempts to classify users in a way that can be useful for identifying (or labelling) user expectations. Since users of a computer conferencing system can also be expected to use other computerized facilities, the paper associates the user classes with classes of system features. Examples from CoSy are used to illustrate the complex problems and trade-offs which the CoSy designers have had to face, and which indeed they continue to face. Since no realistic user can really expect to get everything he wants the paper then discusses the relationship between what the user **expects** in relation to what the user **wants**. Arising from this discussion are some matters which should guide the future development of CoSy and perhaps other computer conferencing systems.

CLASSIFICATION OF USERS

When, early in 1984, CoSy moved from being a prototype accessible to only a few to being a service accessible to many, we anticipated problems would arise from the diversity of our user community. Users of CoSy range from individuals who have been addicted users of five or more other conferencing and messaging systems, to individuals whose first contact of any type with any computerized system has been through CoSy. The CoSy user community ranges from those who enthusiastically embrace anything new to the wary and distrusting family members of scholars who are beginning to experiment. All of these users are learning, by experience (and in part), what is meant by the phrase "the information society".

During its prototype phase, and indeed through the first two version releases of CoSy, the developers have desired to be responsive to and indeed instructed by the user community. Yet, there has been strong risk of the developers becoming overly responsive to the sophisticated users (or at least to those users with whom they can more easily communicate); and lacking in responsiveness to the concerns of more ordinary (more typical?) users.

In software engineering terms, the user interface was specified by means of a prototyping methodology which lacked the control of a written interface specification. Not only were user interfaces at issue: many questions of the functional content of a conferencing system were at issue as well. Just what should the user expect a computer conferencing system to be? This question is analogous to the speculations in Europe 500 years ago when "the new world" was being discovered. It is instructive to explore the categories of users of computer conferencing systems by means of an analogy with the exploration and eventual colonization of North America. Each individual user plays a role corresponding to one of the following:

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Explorer

An adventurous soul, the explorer's life-work is to discover the new frontiers and to bring back new maps, charts, samples, and other information. Once new territory has been mapped and understood, the explorer will move on to explore other territories.

Pioneer

This individual sees clearly the value to himself and the advancement of his discipline, of moving into new territory. He will adopt new tools such as CoSy and will be prepared to sacrifice much to move most of his work into the new domain. Hardships and difficulties are expected by the pioneer and easy to use is a frill. The pioneer believes with passion.

The pioneer reads the works of the explorers, and likes to make connections between them. The pioneer will discover whether potatoes grow in Saskatchewan and wheat in Prince Edward Island. He may even appreciate why some techniques are more appropriate than others, given the circumstances.

Settler

The settler is less passionately interested in improving his lot, and that of his discipline. Driven by the inability to make progress the traditional way; or perhaps oversold on the benefits of a change in approach, the settler makes a one-time major commitment and moves to a chosen new working environment. Willing to work hard, but expecting guidance and stability, the settler has high expectations but lesser resources, and cannot endure the hardships of the pioneer.

As history tells us, successful settlement of geographical territory requires a critical mass, a balance between community and individual interests, and can result in the flowering of productive new nations. The analogy for computer conferencing is, of course, in the promise that such systems offer to a new flowering of scientific, scholarly and intellectual endeavor. The users we care about, as developers of computer conferencing systems, are the settlers.

Frontiersman

In the early stages of settling a new territory, the frontiersman protects settlers and pioneers from unfriendly environmental elements. The frontiersman acts as guide, even as saviour. Like the explorer, with whom he shares many personal characteristics, the frontiersman drifts naturally to the edge of the settled area, since this is where he is needed.

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Patron

The patron provides funding for the explorer, perhaps for some pioneers. The patron requires an incentive, be it only recognition, but may lack understanding of the underlying nature of the endeavor he encourages. The patron often becomes landowner in the case of new territory, but rarely does he become an occupying landowner, preferring to see the new territory settled by others. On the other hand, the landowner who does become familiar directly with the new territory may better appreciate its potentiality.

In the case of computer conferencing systems, patrons who actually use the system may also better appreciate some aspects of the age of information.

Failure of the Analogy

A user model such as the above can provide useful insights to the system developer. Most important, it provides a basis for directing limited resources to correction of the most important problems. A computer conferencing system such as CoSy can meet the legitimate and specialized needs of any or all of the above user types, if the patron has a sufficiently large pocketbook. In CoSy, with direct access to the **quiet editor** facilities, the explorer and pioneer are well served. The setters will find the **verbose editor** congenial, though they may not like being told by the frontiersman (or by the system itself) that they are using a "verbose editor". The frontiersman may use advanced tools to solve some problems for some settlers, but should avoid discussing his methods unless he identifies a potential pioneer or frontiersman in a particular settler.

Another example of a frontiersman "sharp shooter" functional capability from CoSy is the **chat facility**. **Chat** permits the user to send a message directly (and in real time) to another CoSy user. The frontiersmen and pioneers (as well as the system operators) quite like this facility. Some of our experiences with frontiersmen **chatting** settlers have, however, been unsettling. From the initial delight (at being able to converse in real-time) to demand for some ability to turn chat off has been observed to take as little as 36 hours!

All computer software, CoSy included, raises the possibility of providing specialized services facilities for the different categories of users: executive CoSy for patrons; shoot from the hip CoSy for pioneers; and pabulum CoSy for the settlers' children. How much function should a computer conferencing system provide? How should that function be organized?

However useful any analogy, it must not be taken too completely to heart. In today's developing information society, computer conferencing is but one of many influences on the settlers. The land of computer conferencing is not the only land being promised to the settlers. **Office automation; the office of the future;** your own **powerful microcomputer** are all competing for the attention of would-be settlers. And the advertisements and other blandishments of each approach bear remarkable similarities. No one reads the detailed reports of the explorers. And the pioneers, each being committed to his own chosen territory, are universally enthusiastic. So the settlers might be excused for believing that electronic mail is identical to computer conferencing, which is pretty similar to an electronic bulletin board, which of course anyone knows is available on an Apple II microcomputer (probably operated by an 11-year-old in

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Elmira.)

Since computer conferencing does not exist in a vacuum, it is quite clear that one thing which many users expect is too much! Systems specified by explorers and widely used by the pioneer and frontiersman may spell trouble for the settler. The patron-turned-user must be wary of the discontent that leads to cultural disturbance as discussed for example by Nora and Minc (3).

CONFERENCING SYSTEM FEATURES

The question of functional content, perhaps the tuning of functional content to different user needs was introduced in the previous section. Should a computer conferencing system provide an editor; many editors; something in between? What kinds of facilities should be provided **within** the conferencing capability; **surrounding** the conferencing facility; **supplementary** to the entire system? What capabilities should a system have to permit users themselves to select facility subsets or devise new "more appropriate" command structures?

The many possible answers to such questions reveal the underlying complexity of conferencing systems development in today's environment. The software engineer must always give as his first answer, "none" or "no more" (4). To take the example of **chat** discussed above, pioneers using CoSy responded to the request for a facility to turn chat off, by requesting instead that CoSy identify likely dangerous situations and temporarily turn chat off. Some such situations are easily identified: for example one should not be able to chat a user who is engaged in sending a long file from his microcomputer; or one should not be able to chat someone who is chatting with someone else. The system developer recognizes that each of the very many such special situations requires specialized program code to support its identification, handling and so on. Additional code not only must be **written**, but also must be **maintained.** Furthermore, each added function represents a potential **constraint on evolution** of other parts of the system. If we wish to encourage settlers, and not pioneers (while of course continuing to recognize the important role of the pioneer) it is better to eliminate chat and devote the effort to supporting the settlers.

Scope of a Conferencing System

Potential settlers, as was noted previously, are probably encouraged by current market forces to look for one system which will solve "all" their communication needs. Computer conferencing is being introduced to an office-oriented society, not into a primitive society. The settler who chooses a computer conferencing system may or may not have previous computing experience; if he does not then his move to computer conferencing is synonymous with his personal computerization. If he does, it may be that the move represents his second migration: the one he expects will solve all those problems he experienced with the first. The scope of the computer conferencing system is thus a very important issue for the settler.

He may wish to use the conferencing system as a personal filing system; as a

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personal word processing system; to communicate technical papers and data to other individuals, to operate a private data retrieval service, etc. In other words, the settler expects the system to be able to do what an automated office system can do. Of course, those settlers who migrate to the land of office automation will also expect their word processing microcomputers to be capable of computer conferencing! Are all such systems converging? Or, alternatively, will the settlers find themselves in separate nations, each talking a different language?

Society is in a rapid change stage of its evolution towards an information society. During this stage of rapid change there will be a lot of pressure for development of standards, driven by the reasoning that the "separate nations" scenario must be avoided at all costs. But agreement upon standards makes little sense precisely because the changes are so rapid. The Canadian attempt by legislation in 1978, to define what is meant by a "letter" reference (5) is but an extreme example of why this is so.

It has been interesting for us to observe that science funding in Canada in this area is being directed towards those most heavily involved in development of international communication standards. It seems a cautious science policy that favours standardization over innovative research which is at the cutting edge. And the cutting edge of communications and systems interconnection is at the user interface.

One is struck by the inability of governments (indeed any large organization) to cope adequately with the pace of technology. In part, this is a natural result of government as patron not having visited the land of information technology. But even where it has visited, one observes that the visit may be under the guidance of frontiersmen rather than explorers. A recent publication of the Canadian Government (6) presents the "views" of four different federal government office communication systems experiments. In only one of these "views" does any conceptual content beyond an interconnection of hardware components appear. This is quite analogous to the patron returning from his new world demesne and reporting only the details of the wagons and carriages in the wagon train which transported him. By the way, it is debatable that any of these projects recognizes or will be capable of identifying, the value of the concept we describe as computer conferencing.

An alternative approach to understanding the information society in the modern office-oriented context is to construct a conceptual architecture within which different human tasks take place. The BOLD architecture of Online People (7) is an excellent example of an attempt to separate personal from corporate tools and information components. Embedded within an architecture such as BOLD, a computer conferencing system would be expected to provide the basic facilities of exchanging and storing information about a topic. Preparation and manipulation of text by the users' own "favorite" editors, text handlers etc. should be supported.

Conferencing Facilities

What are the necessary computer conferencing facilities? What is a computer conference?

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Users who are (mis)led into a belief that CoSy (for example) provides all the answers for communication about an issue are bound to be disappointed. Computer conferencing, as we discuss it at this meeting, is a metaphor, or model for a particular style of communication and information exchange which is most appropriate to certain categories of problem. The computer conference is not appropriate for all communications, and it is unwise to reinforce any such belief which the settlers may develop.

The CoSy system provides four communication mechanisms or modes: conference, converse, mail, and chat. Chat has been mentioned before, and this paper earlier argued for its demise, at least from the users domain of knowledge. A chat-like capability of getting online help, when requested by a user, might be acceptable, but this author holds the general belief that the real-time immediacy of chat disrupts the users' conceptualization of the conferencing system as something with which he may comfortably interact, intermittently, under his own control. In other words, introduction of the real-time element is confusing to the settler. It will be even more confusing in future when conferences are shared across separate and distinct conferencing systems (which, of course, will not support chat).

Like the conference itself, CoSy Mail is a metaphor; but this metaphor has some hidden dangers. For example if I mail a letter through Canada Post, I cannot get it back. If I mail a CoSy message, I can retrieve it and re-read it; or I can delete it before the recipient has read it. In other words, mail does not behave the way Canada Post mail behaves.

This is an important development, because there is no reason why new technology should mimic the more limited capabilities of old technology. But it results in mail being a mixed metaphor, and not all users may have the same level of understanding of the function being provided. From a system designer viewpoint, it is necessary to have a simple easily remembered command to invoke the mail capability; and there are a limited number of such recognizable "concept/command" words. In CoSy, mail is used to designate the private communication channel; we could use "whisper" (to connote one-on-one) or "huddle" (to connote a small group) but the settlers will be more comfortable with "mail", as long as the metaphor is sufficiently descriptive.

It is not suggested mail be eliminated from the concept of conferencing system. Indeed, some have suggested mail should be eliminated from CoSy, but, having used conferencing systems that do not support private communication, I believe mail is essential. But having decided to support a private messaging capability, we are in danger of being led into thorny issues regarding filing, retrieval, archiving and otherwise supporting a host of functions that, ultimately, require a complete office system. It would be a mistake to put major effort in this direction; better to interface CoSy mail with "any and all" other mail systems. This permits each conferencing system user to use conferencing for those matters for which it is appropriate; to use mail for incidental related communications; and to use the preferred or standard system in his organization's office environment to prepare and manage the bulk of his electronic mail.

Of course, standards become important when mail systems are to be interfaced but again, standards which stultify development by being either too comprehensive, or too basic are to be deplored.

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The Converse (Conv) capability in CoSy is, as described in the User Guide (1), simply a private confidential unnamed single-topic conference. This being the case, there is no justification for it. Conceptually, converse introduces another, and less well formulated metaphor. If we are to build systems supporting multiple metaphors, why not "circulation list", "bulletin board", "lunch room" etc. In other words all of the kinds of communications that take place in the typical working, or even home environment? The answer is obvious; the settlers cannot, and should not be expected to, cope with too many metaphors. And after all, users are perfectly free to set up two-person, unnamed, confidential, single-topic conferences. The frontiersman can suggest that they do this, and we can do without conversations quite nicely.

One reason for diminishing the number of facilities supported in a conferencing system lies in the difficulty of matching the command names to the metaphors used to invoke the function. It seems natural to request CoSy to show participants in a conference. Less natural in a conversation. And how do I find out who will get carbon copies of an item of mail to which I am replying? Show participants is not natural (nor does it work). Work is required to identify clearly the functional metaphors used, and to ensure the command elaborations do not unduly confuse settlers.

WHAT THE USER WANTS

In the above section a few features of computer conferencing systems are discussed, although the detailed capabilities of the conferencing function itself are not described. In a recent industry newsletter (8), I find this description of the needs of users of electronic funds transfer systems, and I believe it applies to the users of computer conferencing systems as well. "The consumer will demand security, privacy, convenience, reasonable cost, understandable information, and simplicity of use". All of these we hope CoSy provides: for example, security through the encrypted conference capability. Some of these wants require compromises; complete privacy conflicts with the desire to share information with others which is evidenced by someone becoming a participant in a conferencing system.

The ultimate answer to privacy of course is that each user will operate his own conferencing system; that is, conferences will be conducted which are distributed over multiple physical conferencing systems on different machines.

Some pioneers have in fact already conducted distributed computer conferences. A system such as CoSy, particularly if its function is restricted to conferencing and mail, has great potential for operating on a small scale at even the microcomputer level. CoSy itself has operated on a 68000-based microcomputer system. The distribution of conferences over multiple systems introduces new issues which should be explored now, and which affect such mundane matters as message formats. For example, in distributed conferencing, the header should identify when each comment was prepared, when it was received by the "owning" conference system and perhaps when it was received by each of the authorized distributed conference sites. In short, we require multiple time stamps, which do not confuse the settlers.

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The concept of an owner of a conference is an important one to retain. Moderator capabilities to restrict or control the distribution of the conference will be necessary. The computer conference, if it is separate from simple electronic messaging, has at its core the concepts of ownership and management.

CONCLUSION

The key purpose of computer conferencing is the exchange of information amongst consenting participants. Harold Innis (9) believed that communication media affect the character of knowledge, and those of us who have experienced the intimacy and altered communication forms introduced by computer conferencing would agree. Computer conferencing offers an important additional medium which cannot but enhance the development of science scholarship and intellectual activity.

The development of computer conferencing facilities for this purpose is a complex endeavor. It is important that complexity be minimized and that computer conferencing systems retain the simple integrity inherent in the conferencing approach. This despite the pressures of the complex and rapidly developing broad technology of information.

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Conferencing in Education

Session Chairman - Mark Waldron, University of Guelph

Linda Harasim and E. Marcia Johnson
Ontario Institute for Studies in Education
The Educational Application of Computer Conferencing for Teacher Training in Ontario

Margaret Ellis and Elaine McCreary
Dept. of Extension Education - University of Guelph
The Structure of Message Sequences in Computer Conferences: A Comparative Case Study

Madge Brochet
Institute of Comp. Science - University of Guelph
Computer Conferencing: A Tool to Enhance Graduate Student Learning

EDUCATIONAL APPLICATIONS OF COMPUTER CONFERENCING FOR TEACHERS IN ONTARIO

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Workshop on Computer Conferencing and Electronic Mail
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ABSTRACT

The proliferation of computers in Ontario classrooms has placed teachers in a difficult situation. They are being asked to incorporate computers into the classroom environment and the curriculum, but the majority of Ontario's educational community has received little training in the area of computer applications in education. Teachers are in need of in-service preparation to use computers, and encouragement and support in the use of other new information and communication technologies. Training resources and personnel are limited, and frequently those available are unable to respond adequately to the scope of the demand. However, recent technological advances in the area of computer networking offer interesting possibilities for applications of computer-mediated communication in the field of education.

This presentation will report some preliminary results of an ongoing project to investigate the potential of computer networks and conferencing systems for the delivery of distance education and professional development programs to teachers in Ontario. Our focus in this paper is on one aspect of the larger study: we consider how to employ computer conferencing systems to deliver distance education activities and how to design such educational applications for the adult learner. Data sources have been generated from interviews with key informants (educators, users, and managers of computer conferencing systems) and from analysis of the literature.

1. CONCEPTUAL FRAMEWORK

Computer conferencing systems have become increasingly acknowledged as key tools in research, collaboration, and organizational decision-making in such fields as science, technology, medicine, law and business although the potential of these systems for educational applications is only beginning to be investigated. For the purposes of this paper computer conferencing will be considered from the point of view of its potential for delivering distance education. Thus, computer conferencing will be examined within the context of its value and relevance towards enriching the options available to distance learners rather than viewed as an educational strategy to supplant on-site learning activities. Distance education is defined here as any mix of learning activities and interactions between learner and peers and learner and instructor which is not dependent on regular, fixed classroom attendance and which takes into account those learners who live beyond the urban environment.

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The vast majority of teachers in Ontario may be defined as 'non-traditional learners'. While many teachers participate in professional development, upgrading, or skills development activities on a short-term basis (often one or two days at maximum), such factors as geographic isolation, family responsibilities, physical handicaps, scheduling conflicts, or lack of appropriate educational programs or facilities limit their access to more comprehensive training. Especially in remote locations, highly qualified personnel may not easily be available to offer more long-term, intensive types of courses. At the same time there is tremendous pressure on teachers to become computer literate and to integrate computers into classroom practice. Ragsdale (1982) defines computer literacy as "whatever understanding, skills, and attitudes one needs to function effectively within a given social role that directly or indirectly involves computers".

For many teachers the introduction and use of computers signifies a need for extensive training which might be satisfied through distance education. Several years ago the eminent Swedish educator, Torsten Husen, predicted that by the 1980s "it should be the rule rather than the exception for a working career to be dramatically affected by technology which translates human talent into machinery, information systems, computer programs, and 'precooked' knowledge which is immediately retrievable for use" (Cross, 1983). Offering on-line training, professional development, and support through a computer conferencing system supplies one potential mechanism for reaching large numbers of learners throughout Ontario and for maximizing available training resources. The consideration of computer conferencing systems for training and educational applications is particularly appropriate for teachers given not only their on-going training needs but also their access to computers in the schools, and in some cases, in their homes.

1.1. Computer Conferencing Systems

Computer conferencing is understood here as the use of computers to link people together across time and space. Cross (1983) has observed that

> computer tele/conferencing is a system which enables two or more individuals at two or more locations to communicate. Without having to interrupt their work schedules and without having to pay for costly travel these individuals can exchange information and learning aids. Through keyboards terminals, printers, and telephone lines, participants access a common computer for extremely efficient direct communication.

Some general features of computer conferencing systems include text editing (either individual or group), sophisticated searching capabilities for conference items, access to external databases (on some systems), and electronic messaging. In addition, computer conferencing systems usually maintain a permanent record of proceedings during the course of a conference, thus serving as a type of electronic filing cabinet.

2. THE POTENTIAL OF COMPUTER CONFERENCING SYSTEMS FOR DISTANCE EDUCATION

Vallee (1982) has observed that "managers and accountants always justify the purchase of a new machine on an economic basis. Yet the real test of a new technology like computers is not that it performs the same task faster or cheaper than before: it must do something that one could not conceive of doing before." In this section we examine some of the problems

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associated with traditional distance education, and with computer-assisted instruction, and consider some of the potential of computer conferencing to provide new options for educational delivery systems.

2.1. Problems with traditional distance education

Although distance education has a wider meaning than correspondence study, it remains predominantly based on correspondence activities (using the postal system to send questions and answers, assignments and grades, etc.) and thus often can be characterized as a one-way communication medium. The one-way character of correspondence courses can impose certain restrictions on the nature and the quality of learning. Foremost is the isolation of the learner; interaction between the learner-teacher and opportunities for sharing and discussing information with other learners are often limited. This would be particularly exacerbated in rural settings where opportunities for face-to-face meetings are rare. The distance learner must be highly self-reliant and both the learner and the instructor very motivated to establish additional communication links to overcome the problems of isolation. If communication between the learner and instructor occurs primarily through the mail, questions can take up to three weeks to reach the destination and up to another three weeks for an answer to return. This is an insufferable waiting period for feedback. Telephone calls can ameliorate the situation somewhat, but distance learners complain not only of the costs involved but also the time and frustration in trying to reach the tutor. AT&T has estimated that on average, the chance of achieving a telephone connection to the right person on the first attempt is only 28 percent (Sharples, 1982). Over one third of all calls are not connected due to busy lines or wrong numbers. Thus, a great deal of time can be lost on non-productive communication activities.

The isolation of the distance learner is compounded by a lack of access to learning and information resources such as libraries. Moreover, overcoming information scarcity in rural/remote areas by sending out at least minimal materials required for a given course incurs great expense and effort. At the Open University, for example, every course unit, case study, and supplementary unit is duplicated up to 5,000 times and distributed to each student in the course (Sharples, 1982). Altering or updating any of the documents can incur considerable additional effort and cost. Despite such massive undertakings, it has been to date impossible to provide access to all the learning resources a student may need, and learners in remote areas must do without.

2.2. The sociology of the learning environment

Computer assisted instruction is in part a product of the open learning movement of the 1960's. During this time, open classroom architecture was common and the ideas associated with individualised learning became popular. Most important of these ideas is that the learner needs to be provided with a rich classroom environment and encouraged to explore and follow individual interests.

The development of computer assisted instruction was an attempt to expand on the idea of individualised learning by providing the student with lessons tailored to performance on specific items. For example, a sophisticated CAI computer programme would branch to more difficult concepts or to remedial instruction based on the student's response to either diagnostic test items or to skill-measuring items. What CAI programmes failed to account for, however, was the fact that the social context in which learning occurs is extremely

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important; effective learning is not achieved in isolation.

Overall, the introduction of new technology into the educational arena has brought with it more questions than answers. Until recently, the use of computers in education has been concentrated almost exclusively on individualized instruction or computer science. From experiences with CAI, it has become evident that while educational gains have fallen short of original expectations and promises, certain significant advances in the quality of the learning experience have occurred. In particular, the learner has come to prefer the computer for certain activities, given its non-judgmental and ever-patient nature. In this case, the role of the teacher, is transformed from that of a repository of facts, figures, and answers, to a consultant or educational facilitator. Thus the social relations of learning are altered. Vallee (1982) argues that the benefits of computers in education cannot be fully realized until the social framework of learning changes, and then most likely only via a different technology, for example, that offered by computer conferencing systems.

> To make it happen, a much clearer distinction should be made between the 'affective' and the 'cognitive' content of education. American teachers often seem to equate all learning with cognitive knowledge, which indeed can be delivered by computer terminals as easily as it can be delivered by books or blackboard. What they miss consistently is the affective part of this knowledge, the emotional link to what is learned. An indispensable part of education is being chopped of in computer-education experiments. To correct this problem, we ought to combine a human conferencing system with the cold repetitive programs that deliver the basic information. When this simple step is accomplished, we may see computer-aided education flourish. (p.32)

Such an approach is embodied in the concept of "computer mediated learning" (Davie, 1984). Computer mediated learning comes much closer to the open learning concept by enriching and enhancing the learning environment by using the features available in a computer conferencing system to emulate a seminar or group approach to learning. Learners are linked and able to communicate electronically to discuss a subject, write joint papers, or work on group projects. Such an approach offers a medium for encouraging a learning network which can overcome some of the isolation experienced by distance learners and incorporates some of the best features of computer communication.

2.3. What Computer Conferencing Systems Can Offer Distance Education

The advantage of computer conferencing that generally is emphasized is its flexibility in overcoming time and space barriers. This advantage is of major significance for education as well. The application of computer conferencing to education can overcome geographical constraints (the need for the educator/trainer or the student to travel) and time constraints. As Cross (1983) notes, computer conferencing brings the expert to the student, wherever that student may be located and whenever that student has time to study. Thus, the learning environment is not restricted by time or place. The electronic medium has the additional advantages of allowing time for thought in organizing responses, self-pacing in learning tasks, and participation in a number of different conferences or learning activities within one day. The use of a computer conferencing system in distance education might also include a full-text information retrieval system to contain a copy of course materials, articles, or supplementary learning activities that might be required for a course. Any page could be amended by the instructor, or read or printed as needed by the learners. This involves not

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only savings in printing and postage, but also it enables any document to be updated or revised as needed thus providing the learner with the most up-to-date version and materials. Of course, this type of saving is partially offset by the initial cost of input to the computer system.

In addition to the advantages of flexibility and access offered by a computer conferencing system, another significant and compelling benefit can be provided; namely, an environment to encourage networking and social interaction of learners. Group learning, peer discussion, and cooperative learning have been found effective strategies in adult education.

3. RECOMMENDATIONS FOR DESIGNING DISTANCE EDUCATION USING COMPUTER CONFERENCING SYSTEMS AND ELECTRONIC MAIL

3.1. Pitfalls and deterrents to electronic learning

While computer conferencing systems offer many advantages as noted above, there are several important pitfalls and deterrents to be recognized and considered when designing educational computer conferencing.

1. Most important, computer conferencing is a new 'medium' and involves interacting in a new 'space'. In order to learn how to move through this 'electronic space', the user will require new skills, attitudes, and behaviours (etiquette). Print-based communication is taken for granted in our society, although members of non-print societies experience great difficulty in learning to attune the eye to discern individual characters and synthesize these to recognize words, phrases, and eventually, ideas. New attitudes toward communication must be learned; new methods for expressing ideas are embodied in the medium; and new psycho-motor skills are requisite for the tasks of reading and writing.

   Less than a hundred years ago the introduction of the telegraph and the telephone necessitated significant learning on the part of users. While today, talking on the telephone is taken for granted, it caused great discomfort and resistance on the part of new users when it was a new communications medium. In an article published around 1900, Angus Hubbard, General Manager of the Chicago Telephone Company, observed that "the man who knows how to use the telephone properly is a relatively rare personage" (Vallee, 1982). The article goes on to provide technical pointers, such as where the lips should be located in relation to the receiver and how to speak into the telephone, but notes that the crux of the difficulty with electronic communication lies in a lack of mental focus. The early user resisted the new communication because of difficulties in realizing that "he is not speaking into a hole in the end of an iron arm, but speaking into the ear of a man."

   Lack of mental focus remains a key problem in electronic communication even today. There is a need for guidelines or protocol to orient new behaviours appropriate to the new medium. Participants introduced to computer conferencing can experience a sense of disorientation when first working in 'electronic space' for they are not familiar with the 'cue loads' of electronic communication. Cue loads include such behaviours as smiling, voice intonation,

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handshakes, nodding, and other nonverbal cues (Sevel, 1984). The discomfort is heightened in group or public communication. This is evident in the case of tele-conferencing where participants, who are already familiar with telephone communication, must learn how to behave when engaged in group telephone activities (Burge, Roberts, and Waldron, 1984). Computer conferencing is similar; it is a form of publishing. What each participant writes usually remains as a permanent record or 'proceedings' to be read by all other participants on the system. Participants in computer conferencing can indicate a reluctance or inhibition in using the new medium because of a fear of looking foolish in front of others compounded by the unfamiliarity of the new terrain. Participants with poor typing, spelling, or grammar skills also feel reluctance.

2. Second, the electronic medium involves new sets of social relations or at least tends to blur some of the status 'cues' traditionally recognized in most other communication forms. Computer conferencing systems have been lauded as offering a more egalitarian form of communication exchange due to their anonymity. Traditional symbols such as sex, race, class, physical attributes, or handicaps are not visible and thus not at play in electronic communications. While this can be seen as advantageous in many circumstances, there are also situations in which the loss of such 'cues' or symbols can be threatening, particularly to those in positions of power and authority. Another possible deterrent to the use of conferencing systems is that people in positions of power may avoid using the computer because they perceive that typing or keyboarding is low-level secretarial work.

3. System software (both at the operating level and the conferencing system itself) can inhibit use. Software must be user-friendly, non-threatening, and easily accessible or the user will become intimidated and stop using the system. The thick operating manuals which accompany many computer communications systems often serve less to 'help' than to overwhelm the user. A learner undertaking a new course of study may be already experiencing anxiety and the medium for course delivery should not add to this. At the same time, one would not want a weak system with no powerful bells and whistles as users gain competence.

4. It is important to remember that the social situation of electronic classrooms is vastly different from that of traditional classrooms because of present limitations of technology. For example, like telephones, computer conferencing transcends distance, but unlike telephones, computer conferences do not permit audio communication. With both visual and audio cues eliminated, conference participants are restricted to the written word. It is interesting to speculate at what point in time computer systems, able to support the mixture of digitized speech and typed text, will be commonly available and further, what we could do differently if we had such capabilities.

5. Computer conferencing systems should be used only when appropriate and not as a novelty; both the medium and the message must have meaning and value to the activity and to the learner. Moreover, computer conferencing systems are not a solution to all communications problems. It is necessary to look at how a computer transmits and organizes messages as this will have implications for the management of learning activities. While the conference has to be seen as useful

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to the participants, interest is not enough to motivate new users to start using and keep using the conferencing system. Without significant input from the conference moderator a conference can run out of ideas and issues to discuss. The moderator should regulate structure, direction, focus, and concrete tasks to be accomplished.

6. Cost may act as a deterrent. Computer conferencing usually involves a number of computer-related costs in addition to any long distance or network charges. The awareness of a 'ticking meter' may negatively affect the quantity and quality of participation.

3.2. Designing for the medium

The context of electronic learning, as discussed above, implies a number of design considerations for distance learning. These are described in the following sections.

3.2.1. System features

One of the most important features of any conferencing system must be its ability to adapt to the changing needs of its users as they become more sophisticated in the use of the system. The Electronic Information Exchange System (EIES) has attempted to address this problem through the implementation of multiple command languages. Four different levels of the language permit the user to:

1. select a numbered option from a full menu listing;

2. select an option from from an abbreviated menu; a statement reminding the user of the larger menu would be displayed but not the full menu;

3. define commands comprised of nouns and verbs;

4. define, store, and invoke command procedures.

While the EIES language implementation is a step in the right direction, it still requires the user to be familiar with a large number of commands or to work with an accompanying system reference card (Strom, 1982).

Franz and Robey (1984) describe a promising approach to user-led system design problems. While their study refers to the design of an insurance company's management information system, their method of applying ethnographic research techniques to the problems of collecting longitudinal data over a two-year period is interesting for designers of conferencing systems. They attempted to capture, using a formative evaluation feedback cycle, the subjective opinions of the end-users of the system during the design phase.

Another important feature of conferencing systems needs to be the ability of a participant to easily follow the "thread" of a conversation. This is usually handled now through the use of tree walks, however, Strom (1982) has pointed out that "there is a problem with forward and back references". Also, as the interconnection structure between conference items becomes more complex, the difficulty of locating related items increases. Strom (1982) has suggested that the use of linked key words would be helpful, but the computer must then maintain large indices. However, when one considers the possibility of using conferencing systems in

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education where at least one of the aims of learning is to be able to establish relationships between ideas, the ability to navigate easily through complex data structures becomes critical.

Yet another feature of computer conferencing systems needs to be the ability of a participant to insert comments in text. For example, if a student is assigned a reading and asked to write a short precis of it, other students should have the opportunity of inserting their comments within subsections of that text rather than simply adding successor comments. This implies a difficult implementation problem, since the text itself might be changed.

Strom (1982) has described the usefulness of inter-item editing capabilities within a conferencing system. Most existing systems permit users to edit single conference items, but the ability to split one item into several or to combine several items into one would be a powerful feature in an educational setting where the ebb and flow of ideas is an important feature of learning.

Data storage and transmission are features of general system design which need to be considered. For example, in Canada about two-thirds of all households are linked to coaxial cable systems which are, at present, being used almost exclusively to deliver television images. In this role they are being underutilized:

> some say the transfer of nonvideo information by cable will be the "new revolution" in home communications. This year, for example, two Ottawa cable systems became commercial distributors of software, using technology pioneered by the financially ailing Nabu Network Corp. One day, this technique will enable any cabled home to rent sophisticated programs for university courses, word processing, spread sheets and so forth for a few dollars a month. The technology permits a subscriber to access large databases without a two-way, interactive link (such as a phone link) to ask for the segments of a database wanted. You need only the standard, one-way cable that brings TV into the home. (The Financial Post Report on the Nation, December 1984, p. 68)

Problems normally associated with the storage of large databases could be overcome by using videodisks which would contain, for example, thousands of different articles, books, or other data sources, including photographs or drawings. Furthermore, extremely rapid data transmission could be accomplished by using satellite signals.

3.2.2. User Motivation

The question of user motivation in electronic distance education is critical. Although computer conferencing systems have the potential to facilitate intercollegial contacts, it is not enough to assume that the mere presence of this new communication medium will motivate course participants. The necessity of learning new skills, of having easy access to expensive computer equipment, and of communicating entirely through the use of the written word will prove daunting even to "keen" learners.

In our interviews with educators, the most frequently expressed response to the question of how to motivate students was to ensure that they receive ample, **useful** information each time they accessed the conference. This means that the role of the conference moderator assumes more importance than one might expect to find in a traditional course. Unlike

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traditional seminar courses where the instructor can assume a secondary role thereby allowing students to determine the flow of discussions, a computer conference needs careful direction by the moderator. In face-to-face meetings the exchange of ideas is spontaneous and rapid; however, in a computer conference, a participant may spend only one or two hours per week reading and responding to conference items. It is the slowness of this communication medium that forces the moderator to impose a careful organization on discussions and ensure that each time participants access the conference, they find some new and useful information. In fact, Tracz (1980) described the sense of letdown he experienced when, after having sent a number of messages, he signed on to the system to find "no message waiting". The conferencing medium holds the promise of being able to deliver quantities of information quickly to participants, but it is the responsibility of the moderator to make that promise a reality.

Of course, while quantities of useful information are prerequisites to the success of a distance education computer conference, the organization of that information is even more important. For example, as with face-to-face communication, electronic discussions can become tangential to the original theme. In such cases, the facility to split ideas into new conference discussions becomes important for the moderator. This feature will allow interested participants to pursue new ideas while the original discussion theme can be followed by other students.

Assuming that the moderator does make available useful information to participants on a continuing basis, one is still faced with the problem of how to overcome initial student resistance to adopting new communication techniques. One method of encouraging participation in a distance education computer conference is simply to make it a requirement of the course (ie. force people). The instructor can stipulate, for example, that in order to obtain credit each student must access the conference at least some arbitrary number of times and must make substantive comments on each occasion.

3.2.3. Skills required for electronic learning

New communication skills will be required for electronic learning. These include:

1. Typing ability: Some people believe that advances in speech synthesis and recognition will eliminate the need for typing skills, and possibly within the next fifteen to twenty years this will be the case. However, the fact remains that typing ability is needed now and will be needed for some time to come. Tracz (1980) stated that

> the skill that I found most critical for effective utilization of a computerized conferencing system was a greater than average typing capability. Not being a fast typist, I began to suffer from "terminal anxiety" brought about by wasting valuable on-line terminal time looking for the "Q" key.

While there is no easy solution to the problem of slow typing, there are a number of good-quality typing tutor packages available for use on microcomputers. Before undertaking electronic distance education courses, students should be encouraged to "brush-up" on their skills for a couple of weeks by using a typing tutor.

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2. Computer literacy skills: At the present time one of the most complicated procedures involved in using a computer conference is accessing it through a packet-switched network. Participants must be familiar with the precise access protocols not only for the network, but also for the host computer. If a person were participating in distance education courses offered on several different computers, then the problem would be magnified. As in business, where a caller's first impressions can be influenced by the telephone manner of the receptionist, new users of computer conferences can have their opinions adversely effected by frustrating, initial access attempts.

   Some communication packages, such as Busyterm or Crosstalk, are available for microcomputers. These packages will not only store the necessary telephone sequences to access remote computers, but will also log the user onto the host computer. Failing the availability of such software, clear, concise, accurate documentation could reduce substantially the problems associated with system access. The documentation should "illustrate the use of the protocol by showing actual dialog sequences that achieve specific objectives" (Gaines and Shaw, 1984). Moreover, since people tend not to read long explanations, it is particularly important that the documentation contain no superfluous dialogue and **no errors**. It may seem unnecessary to have to state categorically this point, but complaints about poor-quality, muddled, or wrong documentation abound in the computer science literature. Also, students should be requested to leave all comments about their first few login experiences within a conference discussion as a form of formative evaluation feedback to the course.

   Easy access to online consultants could also reduce user frustration during initial learning. While the cost of having advisory staff available "around the clock" would be excessive, special advice hours could be established.

3. Communication skills: The lack of non-verbal communication cues in computer conferencing suggests a need for new communication skills. While Hiltz (1977) has stated that the lack of non-verbal cues in written communication could be a good thing since non-verbal cues can distract from the cognitive content of a person's message, it could also be argued that a great deal of non-cognitive, but information-rich communication is contained within such cues. Their elimination from communication could be considered a loss. There is a need to investigate and develop computer conferencing etiquette as part of distance education courses. For example, how does one tactfully indicate to a student that a three or four page "comment" is too long or that two people dominating a conference discussion need to consider other students who may be intimidated by their verbosity. Also, it has been found that people will frequently use much stronger language in computer-based communication than they would normally employ in either written correspondence or telephone conversations (Kiesler, Siegel and McGuire, 1984).

   Much of the responsibility for conference behaviour must be assumed, at least initially, by the conference moderator. Having the ability to split a discussion if it is being taken on a tangential course by a couple of "eager" students is a necessity. The goals and focus of any discussion or conference should be respected and maintained. Moreover, imposing limits on the length of responses, as is often done in traditional courses, may be required. The etiquette of electronic

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communication is still nebulous and much research needs to be undertaken.

Another suggestion for establishing both conference etiquette and some computer literacy skills is to assemble the participants for a short workshop prior to the beginning of the course. Even though there are expenses to be considered with this option, the gains could be significant. No longer would students be communicating with "faceless" entities, but with known personalities. Such a structure is particularly suited to professional development activities where electronic communication can be used to follow-up face-to-face training and encourage collegial networking. Moreover, detailed instruction for system access could be supplied to all participants thus minimizing or even eliminating initial logon frustration.

4. Microsystem design: Equally important as the need for well-designed conferencing systems is the necessity of appropriate microsystems to use for conference access. For example, some desireable features might include the ability to backscroll across previous screen 'pages' so that the user feels less anxiety when watching text scrolling quickly from view. Additionally, such features as a spelling checker or online thesaurus would be extremely valuable tools as participants could then send messages largely free of typographical errors. These features could help to overcome some of the reluctance many adults experience with computer conferencing systems.

   Capabilities for local filing and editing would also be attractive. In this manner, learners can capture information which is of most interest to them from a central source, edit it if desired, and build their own personal depositories of information.

4. CONCLUSIONS

While a number of specific issues have been raised in this paper, we would like to conclude with some general observations and recommendations. Computer conferencing systems are in the early stages of development and, as noted earlier, educational applications have just begun to be considered. In our interviews with system managers and users of computer conferencing systems, we noted that the majority of computer conferencing systems do not incorporate ongoing evaluations of the software itself nor of specific conference content. Data are often collected on such factors as connect time or CPU, but generally none are collected in order that user preferences, behaviours, needs, or interests can be analyzed. For computer conferencing systems to continue to develop and to become more useful as human communication and learning tools, it is imperative that they be more responsive to the needs of the users.

We would recommend that:

1. There be on-going formative evaluations of user responses to the conferencing system features and that the results of these evaluations be channeled into system modifications. This presumes a protean or prototype system which can be changed to respond to what users want and need.

2. Needs assessment research be conducted to determine what learning facilities are currently available for distance learners (particularly teachers), how well these

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facilities satisfy teachers' professional and personal needs, and which courses could be most effectively delivered using computer conferencing. Such research implies that course content be tailored to the new medium. If, for example, it were established that teachers needed a course about computer applications in mathematics education: what would be the content of the computer conference and what content would be handled outside the conference?

Such research can provide an invaluable source of information that can lead to the establishment of a computer-based learning network for teachers and educators in Ontario.

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The Structure of Message Sequences in Computer Conferences: A Comparative Case Study

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ABSTRACT

When two conferences were plotted using symbols to represent speakers, contents, and direction of reference, it was possible to compare: rates of participation, degree of peer interaction, proportion of process statements, and the pattern of message linkages. Personal remarks were classified as reflections of climate, and the cognitive structure profiled to reveal message clusters. Participation, climate and cognitive structures were interpreted as indicators of conference synergy.

INTRODUCTION

The ideas presented in this paper arose from reflection on two conferences conducted in the Fall of 1984 at the University of Guelph. Through the courtesy of both conference moderators, print-outs were obtained and each message in a conference assigned a symbol to indicate its originator, content and direction. By mapping out the structure of each conference it became possible to depict, and to some extent quantify, the pattern of interaction among conferees.

What was and is at issue is the extent to which computer conferencing can provide a method of group communication with the same potential for collaborative thinking and synergy as face-to-face groups. Synergy is treated here as an enhanced capability of human groups which derives from the complementary efforts of individuals. Synergistic benefits include the ability to reach given goals in a shorter time and with less effort than through independent attempts, or to produce creative results unattainable by isolated efforts.

Computer conferencing need only aspire to conditions of synergy as often as the conference goals require it. Many computer conferences unfold as a single line of messages that are read once and responded to once. They do not necessarily build to a cumulative effect. However, in situations requiring concerted group effort among professionals such as researchers, planners, or management teams engaged in joint problem solving or issue analysis, the success of a conference will hinge on how well it facilitates "thinking together". It may be desirable for items to be viewed and read more than once, or to be given reconsideration and successive interpretation.

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Synergistic thinking has both cognitive and affective aspects which do not necessarily emerge in the natural course of a spontaneous computer conference. The cognitive aspect focuses on pivotal ideas in the conference content, and their relation to each other. These key ideas or themes have the power to elicit clusters of comments building on attributes or variations of the original thought. Yet the mechanics of computer conferencing are such that comments which form a cognitive cluster may be scattered throughout the length of a record, or entered and referenced in a way that defies systematic culling. The affective aspect focuses on the conference climate which has, by definition, all the traditional pitfalls of human group dynamics exacerbated by anxieties associated with the use of computer software. This paper examines two recent conferences for indicators of both their cognitive structure and affective climate.

METHODOLOGY

The messages in each conference were reduced to a symbolic display or plot using the symbols presented in Figure 1 and illustrated by a portion of Conference B.

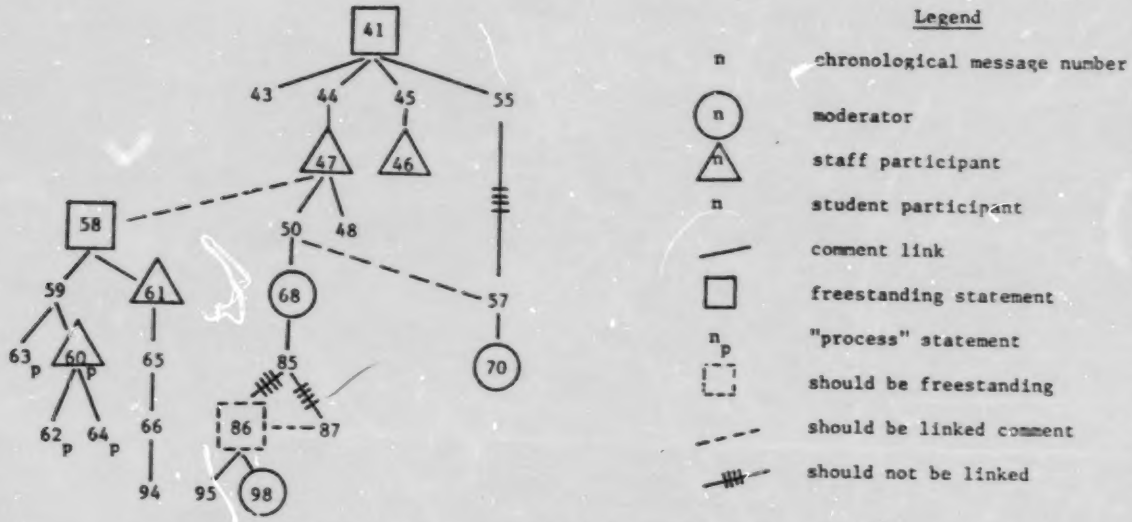

Fig. 1 The Plot of a Portion of Conference B

Two classes of symbols were used. The first simply described the structure of the conference as shown on the print-out, using designators for the type of participant, message content, and linkage pattern. Combinations of symbols (e.g. ◎) were also used where appropriate. The second class of symbols evaluated points at which the existing structure did not accurately parallel content. For example, some statements were referenced to a previous message but actually addressed a new topic. These were designated by a combined symbol for an incorrect linkage that should be freestanding (⫴⬚).

Quantitative analysis of the conference plots calculated rates of moderator, staff and student participation; amount of interaction among conferees; types of message content; and the pattern of message linkages that developed. Qualitative analysis explored the climate of each conference through classifying personal remarks of the conferees. It similarly explored the cognitive structure of each conference through identifying clusters of linked comments by

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their theme and order of development.

RESULTS

The conferences analyzed were of relatively short duration -- seven to ten weeks. The 13 participants in Conference A included the moderator, 8 university undergraduate students and 4 university staff members. In Conference B, the 15 participants included the moderator, 11 graduate students and 3 staff members.

Two of the staff participants were to "trouble-shoot" if difficulties arose in the conferencing techniques. This function proved valuable in all three conferences. The remaining staff members were to "observe" the conferences as a means of ascertaining possible ways that computer conferencing could contribute to the university's instructional programs. The staff members did not, in fact, merely observe but participated to a greater or lesser extent in the conference discussion.

Table 1

Participation Rates, Interactions, Contents and Linkage Structures

Conference title	A1 (General)		A2 (Process)		B	
Time Span	Sept. 20 to Dec. 6, 1984		Sept. 20 to Nov. 5, 1984		Sept. 20 to Dec. 6, 1984	
i.) Participation Rates						
Total number of comments	37		70		237	
Student comments	11	(30%)	35	(50%)	165	(70%)
Staff comments	6	(16%)	9	(13%)	37	(15%)
Moderator comments	20	(54%)	26	(37%)	35	(15%)
Average number of comments per student	1.4		4.4		15	
ii) Interaction						
Student comments directed to students	1	(9%)	5	(14%)	87	(53%)
Student comments directed to moderator	6	(55%)	22	(31%)	35	(21%)
iii) Message contents						
"Process" comments	8	(22%)	70	(100%)	36	(15%)
Thematic	29	(78%)	0	(0%)	201	(85%)
iv.) Linkage structures						
Congruent with content	21	(60%)	52	(81%)	189	(85%)
Incongruent	14	(40%)	12	(19%)	34	(15%)
Total linkages	35	(100%)	64	(100%)	223	(100%)
Clusters (minimum of 5 related comments)	1		2		16	

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From Table 1 it can be seen that in Conference A the majority of comments were made by the moderator. The number of student comments was small as was the percentage of student comments addressed to other students. It is evident, then, that this conference was used mainly as a means of announcing material of general interest to students, a pattern that did not generate much discussion.

Conference A2 had a student/moderator participation ratio which was the opposite of that in Conference A1, indicating a substantial increase in student participation. The percentage of student comments to each other, however, remained low. Student comments were largely addressed to the moderator, a pattern suggesting that Conference A2 was used as a tutorial. According to the participants and observers, it was an effective means of tutoring.

Conference B had both a high student participation rate and a high rate of student-to-student interaction. The percentage of moderator comments was correspondingly low, but this should not be taken to indicate that the second moderator was less involved. The major shift within Conference B was to a much higher involvement of the non-moderator participants. This distribution of participation indicated that Conference B developed into a group discussion.

Conference Climates

The climate of conferences was explored through classifying personal remarks of the conferees. For example, in both sub-topics of Conference A many examples were found of recognition being given to students through the use of their first name or by reference to points they had made in class. Most of these comments came from the moderator along with reinforcement phrases like "quite right", "very good", and "great to see you aboard", although there were also instances of student-to-student recognition. There was enough comfort on the part of at least one student to ask "Could somebody direct me to [a participant's] last message ...?" The most collaborative sequence of remarks took place as people attempted interpretation of what constitutes "garbage" in a conference, how to avoid it, how it decreases as participants become more skilful, and whether or not it simply serves the same "airing" function that group discussion traditionally includes.

The climate of Conference B was similarly developed through a large number of comments welcoming, giving recognition or reinforcement, and displaying self-deprecating good humour . For example, "Don't listen to him --he doesn't know," was one participant's comment to his own previous message. Again, there was enough comfort for a conferee to ask "Can anyone clarify this for me...?", and for others to ask for interpretation or further explanation of a statement.

What distinguished Conference B was the large number of personalizing, climate setting, or facilitating remarks that were offered. Personalizing remarks included ones such as "Thank God or somebody, I finally made it into this system", "This is simply too interesting for me to remain silent...", and "Wow, do I want to get hot on this one". Positive climate setting remarks reduced anxiety about the system or sanctioned certain behaviours such as unsolicited coaching by more experienced users, or the expression of anger in reaction to a statement. Finally, one case arose of advocacy and assistance by two students to enable a third one to enter the conference.

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Throughout Conference B there was some attention given to difficulties associated with using the system -- as there was exclusively in Conference A2 which had been designated for that purpose. From an affective standpoint it is interesting to note that of Conference B's 36 "process" messages, 14 expressed distress or requested help, 19 offered advice or tutoring, and 3 conveyed a sense of relief, adjustment or comfort with the system.

Cognitive Structures

An examination of the cognitive structure of Conference B revealed clusters of comments linked to given themes, some of which developed out of a previous theme while others were prompted by a free-standing statement. Conference A1 and A2 had very few clustered comments as such. There tended to be instead multiple responses to questions posed by the moderator. In Conference B, which explored applications of computer conferencing and future developments in the field of adult learning, 16 clusters were found with a minimum of five comments each, 13 of which were initiated by students. Some themes were relatively self-contained, such as "the use of adult learning principles in work-related situations;" but several themes triggered related discussions. For example, discussion of "mature student attrition from university" led to consideration of "the role of universities in society." On occasion a theme would prompt responses related to several subordinate issues. Figure 2 illustrates such a developmental process where an original remark about "citizenship" drew comments related to "the possibility of individual influence on society" (X), "the power of the press" (Y), and "motivations for action" (Z). The first cluster then split into consideration of "proactive behaviour" (X1) vs. "helplessness" (X2), while the third explored "extrinsic and intrinsic motivations" (Z2) with a counterpoint discussion of "security" (Z1). Interwoven through these substantive themes was a process-centred discussion (P) of the most effective ways to format messages. Cluster Q dealt with the separate theme of applying principles of adult learning in work-related situations.

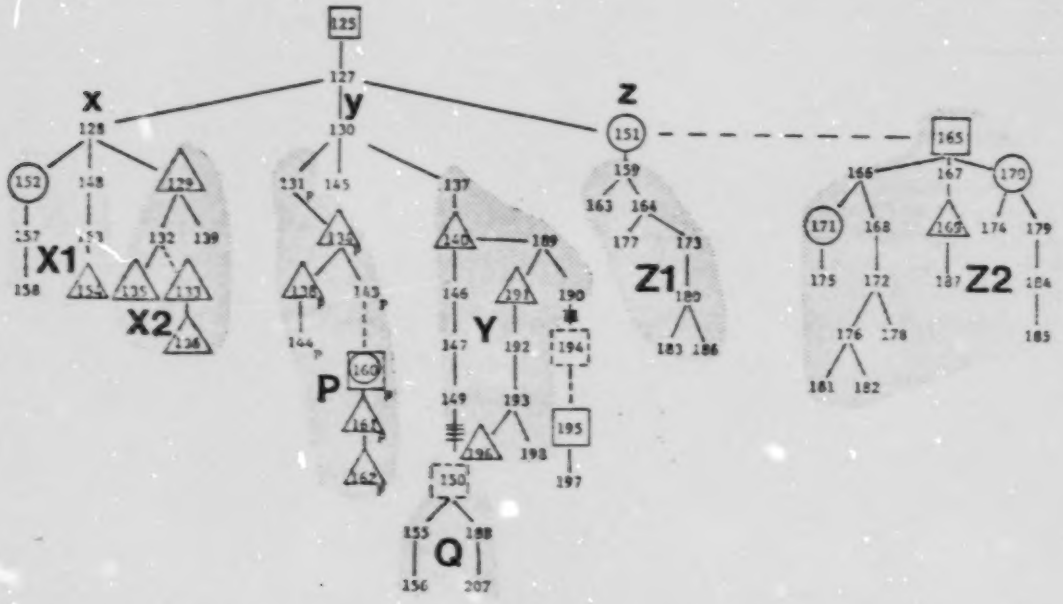

Fig. 2 The Plot of a Portion of Conference B illustrating comment clustering.

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CONCLUSIONS AND CLUES TO BETTER CONFERENCING

Participation Rates and Peer Interaction

From a comparison of Conferences A1, A2 and B, it appears that a high level of moderator participation is associated with a reduced level of student interaction, but this may be coincidental rather than causal. In the conferences examined several other variables were active. Not only were the students in Conference A1 and A2 considerably younger than those in B, they were also subject to the constraints of an undergraduate schedule, while those in B had the flexibility of a graduate schedule. For whatever reasons, student comments in Conference B predominated (70%). Beyond student and schedule characteristics, it is also probable that a content domain which is quite focused to a given task simply will not be expected to prompt as much participant involvement as an intentionally free-ranging conversation that includes contentious topics.

What options are there for moderators to elicit more participation from conferees?

a) model peer behaviour by disclosing something personal such as experience, conviction, insecurity or curiosity.

b) keep directive statements sparse and light-handed.

c) monitor conferee behaviour through their total number of messages and most recent sign-on.

d) pose problems to be solved, or questions that prompt divergent responses leading to further discussion rather than dichotomous answers of the yes-no variety.

"Process" Messages and Linkage Structures

Approximately 15% of the messages in Conference B dealt with "process" or procedural aspects of the conferencing system itself. Furthermore, an evaluation of linkage structures in all three conferences found that 15 to 40% did not accurately reflect the content of the message. The importance of accurate linkages derives from their ability not only to enable but to promote review of cognitive clusters so that successive reading and reflection can lead to greater insight into the problems under consideration. Without accurate linkages comments may float off into isolation and be lost to later stages of analysis and synthesis.

Three suggestions follow from these conclusions:

a) that a separate sub-conference on process be maintained, especially in situations involving novice users.

b) that conferees be encouraged from the beginning to attempt accurate structuring through the use of freestanding or referenced messages.

c) that several short messages be entered, each targeted to a

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single theme rather than entering catch-all messages that cannot be traced.

Climate

As with the dynamics of face-to-face groups, all participants are responsible for creating a relaxed, supportive climate -- this cannot be accomplished by the moderator alone. Climate-building is sufficiently complex that some well-intentioned actions may have the reverse effect: reinforcement from a peer can sound patronizing from a moderator; the use of first names may draw some members in while subtly excluding others.

Present guidelines stem from behaviours learned in face-to-face groups: courtesy; hospitality; giving recognition and reinforcement; sharing non-threatening humour rather than comedy; asking for clarification or interpretation; decreasing distance and formality by disclosing personal reactions or thoughts; sanctioning what might cause embarrassment -- awkwardness, anger, or expertise; and gate-keeping, in the sense of inviting reticent conferees to share what they have to offer the group.

Cognitive Structures

Depending on the goals of a given conference, if it is to reach its synergistic potential, significant themes should be "podded-off" for emphasis and a more complete discussion. If it seems desirable to develop a sub-topic separately from the overall conference, there are two points at which this can be accomplished. Preselected topics can be identified prior to the conference, and set out in a previously circulated curriculum. Such a priori structuring is usually handled by the moderator and is necessarily directive. As long as the sub-topics are clearly defined, it should be possible to direct comments to the appropriate sub-topic conferences with a minimum of confusion and thus reduce concern for comment classification. Such concern could inhibit participation.

In a conference where there is no pre-set agenda or guide to sub-topics, "podding off" can be done as the conference proceeds. After some critical mass of comments within a theme has accumulated, the ones identified as belonging to that theme can be copied to a highlight conference where more extensive discussion can take place. While the moderator could both identify special topics for emphasis, and select comments for inclusion in that highlight conference, previous experience suggests it is worth the effort to make some of those decisions collectively. For instance, use of the nominal group technique to select topics and classify comments jointly will promote group "ownership" of the process. Similarly, brainstorming rules strongly suggest that participants' contributions to the discussion should be acknowledged by copying their comments unaltered to the highlight conference.

Returning to the theme of synergy, it may be desirable that some sort of "closure" be reached on each sub-topic. The task of analysis, synthesis and interpretation could eventually be delegated to a participant who would then edit the comments and develop a summary for the group. The other participants would then have an opportunity to add final comments before an ultimate closure of the topic was imposed.

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From the present study it appears that in order to derive maximum synergistic benefit from participation in a computer conference the moderator must i) encourage full participation by all conferees, ii) urge accurate structuring of messages, iii) promote a mutually supportive climate, and iv) focus attention on significant ideas to obtain a thorough discussion of them. As in management of sophisticated face-to-face group communications, the moderator's role will become a complex process skill. Appropriate training, and development of tools such as the ongoing conference plot demonstrated here, will enable moderators to monitor both participant behaviour and the development of topics. From this information both reactive and proactive measures can be taken.

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Computer Conferencing as a Seminar Tool: A Case Study

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Workshop on Computer Conferencing and Electronic Mail
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ABSTRACT

The purpose of this article is to describe and discuss the introduction of computer conferencing to a group of graduate students in the School of Extension Education at the University of Guelph. Students used the computer conferencing system, CoSy, as a seminar tool for a period of approximately ten weeks during the fall '84 semester. Conference activity was monitored during the semester via an informal case study, with a view to evaluating the progress of the group in adjusting to this new communications medium. It was also hoped that the study results would provide recommendations to other groups planning to use computer conferencing in a similar way.

INTRODUCTION

Together with fellow students, three conference guests and a moderator, I participated recently in a semi-controlled experiment in computer conferencing. Students in "Adult Education: Principles and Practice" were asked in the autumn '84 semester to participate in the use of a particular computer conferencing system developed at the University of Guelph. There were several objectives in setting up this conferencing experiment:

(a) to expose participants to recently developed technology (Waldron 1984)
(b) to develop a level of comfort in using this technology (Waldron 1984)
(c) to discover some of the advantages and disadvantages of the use of this technology in a learning environment.

It is important to stress the phrase "advantages AND disadvantages" in the third objective. It is not to be assumed automatically that because this new form of communicating involves the use of computers that it will be welcomed, or accepted. A new computer tool needs more than efficient design to permit it to succeed. It does not stand alone, and it may fail for reasons that are leagues removed from any consideration of the product. "Factors which have little to do with how well or poorly the system is designed may determine its acceptance or rejection by the target users" (Hiltz 1984, p.33).

The target users in this experiment were full-time and part-time M.Sc. students in the Adult Education program of Extension Education at the University of Guelph.

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In addition to the moderator, three observers were invited by the moderator to participate. One observer took the role of an active participant in the group's conferencing, while the remaining two observers, from the computer conferencing technical team, participated primarily as technical resource persons. At the beginning of the experiment, only one of the student participants had had previous computer conferencing experience, although all in the group had been exposed to some form of computing.

The proposed participation in conferencing was outlined to the group approximately two weeks into the semester. The group agreed that the conferencing to be attempted would be structured along the lines of an informal seminar session. Since the group met once a week for three hours, it was hoped that additional contact between group members would increase the exchange of ideas and information within the group.

EVALUATION OF COMPUTER CONFERENCING AS A SEMINAR TOOL

To evaluate the usefulness, and degree of success of this project, it was decided to monitor the conferencing process as it evolved. A case study format was chosen, and it was hoped that the structure of the conference, yet to be evolved by the group, would become evident via this method.

Participants were interviewed twice during the semester -- once after approximately a month of exposure to the system and again, at the end of the semester. The short time frame of one academic term makes it difficult to draw very specific conclusions; it would be more valuable if adjustment to the use of conferencing could be measured over a longer period of time. What was obtained in this study might be described as in-progress "snapshots" of how the group adjusted to a new technological tool, rather than a complete case study.

What was looked for, in this study, is what Dr. S.R. Hiltz describes as a "systematic description" of our experience, from which we can make some evaluations.

> "This is not simply a matter of judging the degree of success of failure. If the invention (in our case computer conferencing) appears to work, this judging does not tell us WHY or HOW it works. If we are to be able to describe a social invention in a way that makes it potentially useful in other situations, we must grasp the social principles underlying its effectiveness" (Whyte, 1982).

This idea of "underlying social principles" ties in with the quote at the beginning of this paper. In the same way that there is more going on in a classroom than the exposition of a certain amount of information, there is more going on within our group as we learn to computer conference than simply grasping the commands and design of one particular computer program. If we can determine what are the factors that really make us feel good (or badly) about our new learning project, we can then make sound suggestions on how to help others ease into a high-technology area in the most comfortable and efficient way possible.

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Experience teaching non-technical people about new computer tools reinforces my conviction that "technological innovation is merely a potential" (Hiltz, 1984. p.29). Getting the code right so that the program will run means precious little to the non-technical user, although the truth of such a statement is still unpalatable to many who think that COPY SOURCECODE*FORA.PROGRAMtoMADGE=BROCHET is a simple instruction. It is not a given that because a technique is computer-related it will be accepted, and used by a sufficient number of people to consider it a success.

The major objective of this case study, therefore, is to obtain, by a variety of methods, a clear picture, not of what the University of Guelph conferencing system is designed to be, but of what this particular group made of it during the course of this semester.

Related Literature

The area of computer conferencing is relatively new; articles appear in trade journals and pop-tech magazines that deal, most often, with new techniques in conferencing-- i.e. how to set up conferencing systems in corporations with far-flung branch office locations, etc. Less is to be found on how people learn about these techniques, and how they incorporate them (or fail to incorporate them) into their working or learning environments. Rather than reflect research on a variety of case studies from differing environments, the focus of this study is centered on the activities and dynamics of this particular conferencing experience.

Several of the methods outlined in the Hiltz book "Online Communities" were adapted for use in this study. For example, it is obviously essential to ask users for their opinions and reactions early on in the project, while start-up experiences are fresh in one's mind. Projections made at this stage are also of value, as they can be compared with actual experiences at the end of the semester.

In addition, a post-use questionnaire was a part of this project. This had to be distributed prior to the end of the session, however, which meant that some interesting questions could not be asked.

The second ingredient in the methodology is the observation of the conference, and in this area I took two different roles. It was important to me to remain an active member of the conference, and to not allow my evaluative task to put me totally on neutral ground. This was somewhat difficult to manage; I valued my position as a fellow student in the group and did not want to be viewed only as a conferencing technical aide. As the semester progressed, it became evident that a balance was possible, although inevitably some observations on the conference were controversial.

THE STRUCTURE OF COMPUTER CONFERENCING

Computer conferencing is a term that refers to the use of a computer to help you communicate more effectively. The computer does this by allowing you to

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read and write messages on a variety of topics whenever you choose and from whatever location you desire, as long as your desired location has some type of machine that will allow you to connect, or place a call to the computer that is running the conference. You dial up the CoSy system via a phone line (if you are off-campus), type in your identification code, and view a listing of all the the conference titles in the system. You do not have to become a programmer to use a conferencing system. Once you have mastered the commands that tell the computer what you want to do, you can concentrate on what you want to say and read. The internal workings of the conference are hidden from you, in much the same way that you can dial a phone call to Norway, without having to worry about the electronics involved.

Advantages of Computer Conferencing

The key phrase in explaining the advantages of communicating this way is: TIME AND LOCATION INDEPENDENT. People do not have to be simultaneously connected. Person A can put in a message at 8 a.m., person B can respond at 11 a.m., Person C can respond to A and B at 2 p.m., and so on (McQueen, 1983). You can check what you want to read at 2 a.m. and respond to a colleague on the other side of the country. Ideas can move around quickly; it's similar to picking up the phone at reduced rates every time WITH the bonus of knowing that the person you are calling will always be available.

Another aspect of computer conferencing that makes it really exciting is its ability to allow you to cast an intellectual fishing line, so to speak, into unknown waters. If you set up a new conference on a topic of interest to you, and you make it open to all, you open up your communication potential enormously. People you have never met can respond, perhaps with exciting new ideas; you can "meet" colleagues, form new associations, exchanging ideas with many more than might be available to you via the more standard methods of communication - i.e. letter/phone. There are some obvious liabilities here, common to all "open" conferences, (messages that are off-target, non-relevant, etc.), but the potential gains outweigh the risks.

Other potential advantages to be considered include a certain ease across status barriers that is observable in some computer conferencing. Messages can be transferred at high speeds -- you can collect opinions on a topic in a matter of hours, or perhaps co-author a paper with a colleague in another part of the country without the traditional, type-mail-revise-type-mail turnaround time.

The CoSy Computer Conferencing System

Developed at the University of Guelph, this system provides a particular structure which allows us to access open conferences, and those closed conferences to which we "belong". Features include the ability to set up a conference, if we wish to do this, and to send private messages to individuals. The conferencing service is easy to use for the individual who does not have much experience with computer conferencing, but at the same time sophisticated enough to provide facilities for the advanced user. Within CoSy, a "conference" is a number of related messages pertaining to a certain theme.

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Every user can be a member of many conferences, each containing discussions on different subjects. Each conference has a moderator who decides which users may join the discussion, and any user can start and moderate a conference.

The actual text of the conferences is stored on a large computer at the University of Guelph; and is, in fact, a database, managed in such a way that we see it as an independent service. We use CoSy when we want to, without necessarily becoming involved in other aspects of computing at this university. Help in using CoSy is provided on-line (at the terminal), through a User's Manual, and via several staff members of the Institute of Computer Science. It is assumed that getting started in CoSy is relatively easy, even for those who have had no previous computing experience. Data from this study indicates that even though users who are new to computing will persevere and learn how to use CoSy, they will have a more positive experience if they are provided with an easy to grasp introduction to the service.

INTRODUCTION OF COSY TO THE GROUP

A brief overview of computer conferencing was given by the conference moderator, followed by an introduction by a member of the CoSy technical team. Part of this second session was designed as a "hands-on" lab in getting started using CoSy. There were serious problems with the operation of CoSy during this start-up session, and in addition, various technical points surrounding identification codes for participants were not taken care of satisfactorily at this time. As a result, several class members were not able to even get into the conferencing system during this training session. Help was provided later on, and eventually all members of the conference used CoSy, but there were serious slip-ups in the initial training offered to the group. Group reaction to this can be seen in answers to several of the questions in the first questionnaire.

Characteristics of the CoSy Conference
Time Period One - September 30th-November 5th

During the first week of conference activity, only three members and the moderator were able to use the system. Throughout the project, these three members maintained a heavy involvement in the conference, and one can speculate that their accidental headstart helped here.

During the time period September 14th - October 5th, participation in comment writing remained stable with the initial three class members and moderator; on October 5th a new participant joined the conference with a comment. The first "observer" made a comment on October 9th, the first technical support observer answered a problem on that date, and a new participant came on, stating that it was the first time they had been able to get into the system. Another first-time participant appeared on October 10th, commenting "Thank God or somebody that I finally made it".

It would appear that this gradual start-up phase is not a plus in conference

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management; those coming on to CoSy for the first time and finding that there are already over 30 comments in the conference must feel that they are somehow "behind"; in fact they are at a disadvantage in that they are still struggling with the structure of commands, and not yet free to use the system smoothly.

The slow enrollment trend continued with another participant coming on two days later, followed by another on October 13th, another on October 18th, another on October 30 ("Greetings -- I am finally on this system -- what a great feeling - thanks for all your help") and a last group member on November 5th ("I've finally made it"). This last member had 156 messages to read through to "catch up" with the conference. There are more reasons for these staggered start dates than poor organization of identification codes. It was very difficult for several of us to access computer terminals and this meant that if you had problems one week and were not able to get started, you had to wait until you were next in Guelph to try again. Overall, I think that our adaptation to CoSy would have benefitted from all of us starting on the conference at the same time.

Emerging Content and Style
Period One - September 30th-November 5th

The following is a brief outline of the topics that emerged in the group discussions during Period One. Next to each topic is a number, representing the approximate number of comments that have addressed this topic.

Topic	# Comments
Present day applications of specific projects from the history of adult education	(6)
Current state of distance education	(7)
Help using CoSy	(15)
Use of CoSy	(17)
Technology enhancing learning	(8)
CoSy as a method of delivering a course	(3)
Farm Forum type learning for seniors	(4)
Essay assignment	(5)
Education as key to dealing with rapid change	(8)
Issues of values	(2)
Factors affecting mature students and associated problems	(20)

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Adult educators as a motive force
in the definition and shaping
of future adult education policy

Topics now branch into:
Paolo Frere's pedagogical model
role of media
proactive adulted
role of media
western political trends
regarding concern for less
fortunate
what is security
intrinsic/extrinsic motivation (28)

From this brief overview there appears to be a movement to less structured topics, as the conference progressed. Rather than a topic being the key component across a range of comments, it seemed as if people picked up on parts of other comments and commented on a line or phrase of another entry. Ideas seem scattered; when one reads through the entire conference, it is difficult to see any overall direction at this point. Several possible reasons for this lack of structure, emerged in the end-use questionnaire, in which participants talked about the their perception of the role of the moderator and the role of non-group observers.

It should also be pointed out that what one participant may perceive to be a lack of direction in the conference may be viewed as creative brainstorming by other group members. In addition, group members who had to travel to gain access to a terminal were certainly unable to interact with the conference in the same way as someone with a terminal on their desk. In this sense, we had a somewhat artificial conference environment on our hands.

At the conclusion of Period One, after approximately one month of use, the content of the conference reflected 12-15 topics, which were addressed at length by 3-4 members of the group, with other group members adding comments at less frequent intervals. The question of message duration was clearly one that affected the structure of the conference; many messages entered at this time were too long to be read on one screen. If a message is over a certain number of lines in length, it is automatically more difficult to read; the question that is more difficult to answer, however, is whether messages over 2,000 characters long actually pull the conference off track in a significant way.

Dominant Personalities

Another factor that had emerged by the end of the first month of CoSy use was that dominant personalities were clearly identified in the conference. The fact that several members of the group had problems accessing a terminal is important, but one also has to look at individual writing styles and personalities. There is a danger here that making a comment, in certain circumstances, can be perceived as amounting to "butting in" on what has

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become a private conversation. And what rules do we use then, when the conversation is going on in a public conference?

The role of the moderator is directly linked to the amount of dominance any individual participant has in a conference. At the end of Period One the conference moderator was allowing the conference to flow, without setting specific guidelines or making any large number of suggestions, although there was some indication that this would change at some point.

Period One Conclusions

Appendix A to this report is a summary of the results of the CoSy Early Use Questionnaires received to date.
Some of the questions are immediately recognized as unnecessary, given the size of our group. Our involvement with CoSy is a short-term project, and it is difficult to make conclusions that might not be that valid, were we to use computer conferencing for a longer period of time.

In spite of these limitations, the data received in the Early-Use questionnaire is valuable to the case study. Of the eight returns, four of us study part-time -- three full-time. English is the primary language for all except one; reading speed in English is judged to be very fast for two, fast or medium for five. Six state that they are more effective when they speak than when they write -- only one member claims excellent typing skills, but everyone can manage some sort of typing.

One of the group thinks computers are "wonderful", but five others are at neutral or above, with only one person moving down the scale towards the "computers are terrible" position. I was surprised to note that everyone has used a computer before, although only one had previously tried a computer conferencing system.

Two of the group have our own terminals -- four have no immediate access to a terminal and two share access. We are very split on the average length of time necessary to get to a terminal; for four of us, it takes no more than two minutes, and for the other half of the group it takes 20+ minutes -- the other end of the range.

Two group members agree that they would not trust computer storage of paperwork they use daily; two of us found the CoSy manual hard to understand, but five found it easy to read.

The clearest message to come out of this questionnaire relates to the introduction to CoSy at the beginning of the semester. Rating the introduction of CoSy to the group, six responses were clustered well below the OK mark, with two of these on the "terrible" mark. Rating comfort level with the intro hands-on session, four were clustered on miserable, with only one above the OK mark. It is interesting to note, however, that no one thinks CoSy will be useless as a result of this negative experience. Two responses indicated "skeptical" -- five either picked "limited value" or "useful in many respects" and one person stated that CoSY will "revolutionize work/communication". With half the group stating that they "feel required" to use CoSy and the negative rating on the intro sessions, it would be natural to assume that some members

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would have no use for the product, but this did not turn out to be true. Specific handicaps, such as difficult access to terminals, not enough time, preference for face-to-face communication were listed as items which may limit probable use of CoSy, and these handicaps were mentioned again as being significant in the end-use questionnaire. These problems, however, do not seem to be so great as to eliminate the use of CoSy. Overall, group members saw a probable increase in the time per week to be spent using the CoSy conferencing system.

PERIOD TWO - NOVEMBER 6th-DECEMBER 13th
CONTENT and STYLE

The following topics continued/emerged during Period Two of the conference:

Intrinsic/Extrinsic Motivation	6
Need for/How to Define Security	5
Applying Adult Education to Actual Work	3
Power of Collective Action	4
Fighting Government Cutbacks	3
Development of conference Towards 2000 (course)	12
Help using CoSy	2
Wrap-Up (good-byes, thanks, etc.	15
Information	8

The same non-structured form continued in Period Two of the conference up to the time the moderator requested comments on a specific topic, namely brainstorming for topics to be covered in a course to be entitled "Towards 2000: Options for the Future of Humanity". Participants responded to this suggestion with 12 comments; messages became slightly shorter and everyone seemed interested in contributing to this topic.

During the last week/10 days of Period Two there was considerable activity under the topic Wrap-Up. Again, the moderator asked for comments on the course, and people expressed themselves warmly, with generous remarks on how they felt about the course and the group members. It is interesting to note that although members overall felt that CoSy was "not particularly effective" for "sociable relaxation", this wrap-up topic contained very warm, sociable messages -- in fact the farewells were made more on-line than in the classroom.

PERIOD TWO - CONCLUSIONS

Appendix B to this report is a summary of the results of the CoSy End-Use questionnaire.

In the end-use questionnaire, participants were asked to give their impressions

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of CoSy. A majority of participants rated CoSy on the plus side of neutral in ALL of the following categories: Stimulating, Productive, Time-Saving, Friendly, Easy to Use, and Not Frustrating. Ten of twelve responses ranked CoSy at #3 on the Easy-to-Use scale, with the other two responses ranking CoSy a #2 on that scale. This indicates that, regardless of individual experiences at the beginning of the project, people generally ended up in agreement, at least on this point.
Nine group members felt that use of CoSy was "worthwhile in certain respects"; three felt it was "very useful" -- no one thought it to be without value.
Again, indicating a uniform response, 10 of the 12 group members took 1-5 hours to learn how to use CoSy "reasonably well".

Nine of the group were "sometimes" distracted by the mechanics of CoSy -- eight people were either "Almost Always" or "Sometimes" overloaded with informaton, but 11 out of 12 group members felt either "sometimes" or "almost always" able to "be in personal contact with other participants".

Responses were somewhat more divided on the topic "How satisfactory do you think CoSy is for a variety of activities?" Nearly everyone in the group found CoSy "Very Satisfactory" for "Giving or Receiving Information" and for "Exchanging Ideas and Opinions". A majority found CoSy to be less effective as a medium for "Resolving Disagreements" or "Expressing Negative Emotions". Two-thirds of the group were at the Neutral point or above in response to whether CoSy was a "Satisfactory Way to Get to Know Someone", but two-thirds also felt that CoSy was "Not Satisfactory" as a means of "Social Relaxation".

One of the most important pieces of information to come out of the second questionnaire relates to what factors tend to limit a person's use of CoSy. Five of the group identified "Inconvenient Access to a Terminal" as the "Most Significant Factor" limiting their use of computer conferencing. In the responses to the first questionnaire, inconvenient access to terminals had been mentioned as a potentially hindering factor, and this continued to be a serious problem for the conference. Other factors limiting the group's use of CoSy were "Had Some Bad Experiences" (very important for 3 members -- somewhat important for 5 members) and "Green Manual Too Hard to Read", listed as "Very Important" for three, and "Somewhat Important" for 5 people. "Not Liking to Type" was listed as "Not Important" for 10 out of 12, even though few in the group listed themselves as good typists in the first questionnaire. Other items considered not important were "No One on This System I Wish to Communicate With" and "I'm Not Interested in the Topics Being Discussed". In spite of the answers to the last item, which indicate that most people were interested in the topics discussed, only one member of the group claimed to have picked up a lots of ideas from CoSy. Most of the answers here fell in the "A Few" to "Absolutely None" range. It would appear that while people were generally interested in the topics, few people felt that they obtained new ideas from their participation. Similarly, only one person felt stimulated "very often" by the development of new topics in the conference, and seven out of twelve responded in the "sometimes to never" ranges when asked if they felt satisfied by the "level of response they received to their conference contributions".

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Role of the Conference Moderator

The group provided the study with some clear guidelines on what they felt the role of the moderator should be in a CoSy conference. Everyone responded that the moderator should "play a leadership role in the development and management of a conference" (8 in the "always" range and 4 in the "sometimes" range. Only two responses were above the "sometimes" range however, in answer to the question "Do you feel that our conference moderator played a leadership role in this conference", with 10 responses in the "sometimes to never" range. Suggestions on what the role of the moderator should be are listed in full at the end of this paper, but are worth repeating here.

> "Ensure that all participants are registered. I wasted a lot of my valuable time. I wasn't always available when resource people were available."
> A moderator should:
> "comment more frequently on the week's messages"
> "summarize on a weekly basis"
> "provide direction"
> "re-direct when off topic"
> "limit comments of observers"
> "give group direction in its discussion"
> "initiate discussion on conference topics"
> "keep participants on track"
> "equalize participation between people" i.e."John, we haven't heard from you for a while; what do you think of ...?"

Another interesting, but somewhat different comment was made with respect to the moderator's role in this particular conference.
"The lack of leadership role was actually positive, I thought, providing a less structured approach while participants became comfortable with CoSy."

Role of Conference Observer

A wide variety of comments were also provided in the end-use questionnaire with regard to the role of the invited (non-technical) conference observer. Suggestions regarding appropriate involvement from a non-technical conference observer are listed below:

> "clarifying"
> "offering facts/relevant data"
> "I am not sure whether he/she should offer opinions"
> "why were observers allowed who were not connected to group?"
> "s/he should report to the moderator"
> "I feel that a non-technical conference observer should perhaps limit the role to that of a participant. At times it seemed that the observer was playing the role of the moderator."
> "I felt awkward because I thought we had a closed conference, and I didn't meet the observer."

The group was asked on the questionnaire if they felt that dominant personalities emerged during the course of the conference. Nine group members responded that they felt this was the case -- three out of twelve answered that this was "perhaps true". Two group members felt that the dominant personality was an observer; one person felt that a particular group

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member was the dominant personality and the majority (seven) felt that the dominant personality was a mixture of group members and observers. Another comment was added here with regard to the problem of accessing terminals -- "perhaps certain group members were dominant because of frequent access."

However, in spite of some clear feelings from the group that the conference was dominated by a subset of members, most participants went on to answer that this did not affect their own participation in CoSy.

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

In considering what conclusions can be drawn from the experiences of this project, it is important to recall the objectives of the study, mentioned in the Introduction and Objectives sections of this report.

First, let us look briefly at the objectives for the experiment itself, namely:

(a) to expose participants to recently developed technology
(b) to develop a level of comfort in using this technology
(c) to discover some of the advantages and disadvantages of the use of this technology in a learning environment.

It appears evident that in terms of these objectives, the experiment was very successful; in the end-use survey, group members stated that they had, almost without exception, become aware of, and comfortable with CoSy conferencing, and that they found CoSy to be a useful tool.

In addition, during the last few days of the conference itself, several messages in the conference dealt with the reactions of participants, who stated that they had appreciated being able to learn about new technology and "get introduced" to computers.

In terms of the third objective, participants clearly identified, in both surveys, some of the advantages and disadvantages of using CoSy as a seminar tool. Some of the "factors that discouraged use" related to the design and documentation of the CoSy system itself, while others had little connection with CoSy system design/operation.

The primary objective of the case study, on the other hand, was listed as being:
to obtain, by a variety of methods, a clear picture, not of what the University of Guelph conferencing system is designed to be, but of what we make of it during the course of this semester.

Obviously, there is considerable overlap between the objectives of the project and the objectives of the case study. All the objectives center around an evaluation of communication patterns set up via the use of a computer tool. The focus is on how we adjusted to this new communications medium, and the extent to which it became an accepted part of the way we communicate.

With varying amounts of enthusiasm, group members participated in computer

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conferencing during the semester, finding out what they liked and didn't like about the process. These discoveries can help the designers of any conferencing system, as the insights gained relate directly to the factors that make us feel good or badly about a learning experience. Computer conferencing has adults as its primary market, so starting to use CoSy is an adult learning experience. We know that adult learning is voluntary (Waldron, Moore, 1981. p.21), and that unless we create a positive learning experience for new conferencing candidates, it is likely that they will reject the system. The system will fail for "reasons that are leagues removed from any consideration of the product". If we ignore the factors that help make the adult learning experience a positive one, we risk non-participation in conferencing, with subsequent loss of time and cost-savings. Hiltz references Blair (1978) on this point:

> An examination of the resources of U.S. business shows that nonclerical personnel are the largest labour cost, and the principal activity of non-clerical staff is communication. Thus, the greatest leverage for the benefits of office automation is in supporting the communication activities of nonclerical personnel...

CoSy is a tool to be used primarily by adult professionals; it will be successful when the design and performance of the system are excellent, and the non-technical factors that relate to user acceptance are incorporated into the CoSy learning/management environment.

Specific Recommendations

What can we draw from the data collected in this case study to help us ensure that CoSy has all the requirements for enthusiastic user acceptance?

First of all, it is clear that CoSy design is already at a level where most users are able to see its value and incorporate it into their working environment with a minimum of problems. Suggestions can be made, however, to certain aspects of the CoSy learning experience.

(a) Although group members succeeded to a high degree in using CoSy in a comfortable manner, they did so without the advantage of a good introduction to the system. I would recommend that a professional, well-organized introductory tutorial replace the standard manual for intro training. It has been said that resources cannot be spared for this type of activity, and that most people will see how great conferencing is and use it anyway, struggling through their own personal learning curve. I disagree with this attitude, and think that several of the items now listed on Appendix 1 as "disadvantages or negative consequences of using CoSy" might not be issues, had the system been clearly explained in an intro seminar. The effort required to develop an easy-to-use "sample lesson" handout would be regained in terms of less anxiety for novice users, and less chance that the new professional user would reject this communications medium.

(b) The question of timing is closely related to the issue of introductory materials.. I think it is important that all details of registering participants in a conference should take place at the same time; no one should be "left out" for several weeks of a conference, especially a

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short-term conference. Necessary arrangements to get everyone in the conference should be handled as precisely as possible, so that participants can start to participate in CoSy as soon as they hear about it. In this way enthusiasm generated by initial discussion of the product will not drain away with people trying to find out who to contact, and when, in order to get their identification codes in order. There is no more important time to make an easy-to-use system look truly easy than during the first days a naive user makes contact with the system.

In spite of the difficulties getting everyone started off in CoSy, however, the results of the surveys indicated that by the end of the test period, nearly everyone viewed CoSy as "easy to learn"; only one person in the group needed more than 1-5 hours to feel comfortable using CoSy. This might seem to mean that most users will persevere, no matter what the initial learning experience is like; I disagree here, as it is important to remember that this particular group saw participation in conferencing as part of the course requirement, and would therefore be unwilling to state openly that they were not going to participate.

(c) Access to terminals is clearly an area that gives problems to CoSy users in a setting such as the one experienced in this project. There was a distinct difference in participation levels and attitudes between those members who had terminals in their offices, or close by, and those who had to travel some distance in order to sign on. If one is looking for a uniform level of acceptance, it is essential that a uniform level of access be provided to participants. Perhaps there might be some way that students using computer conferencing as a seminar tool could borrow terminals from the department for the semester, if they had no access on a day to day basis.

(d) Consideration has to be given to the importance of the role of the moderator in computer conferencing. Earlier in this report suggestions were listed which reflect participants' thoughts on the role of the conference moderator. This is obviously a topic where there are differing points of view, with value to be seen in both the structured and non-structured definitions of what a conference moderator should provide. What is clearly important is that the moderator discuss with the group his/her ideas as to what this role provides, with a view to finding out what is most effective for the aims of that particular conference. There may be conferences in which it would be totally non-productive for the moderator to define closely what type of contributions should be made, and others in which the complete opposite is true.

(e) The role that participants play in a conference is also a topic that should be discussed as the conference gets under way, especially in situations where people are using the system for the first time. Issues such as that of the "dominant personality" and its effect on the group should be discussed early on in the conference, while communication patterns are still flexible, and people are not defensive about their communication styles. Questions about message length and what types of topics are appropriate should be aired, again early on. In this way group members will have the opportunity to develop guidelines collectively for their conference, or reject the very idea of guidelines, if they think that none are needed.

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(f) The concluding recommendation deals with the question of the role of observers in a conference. Since the conference is a group effort, it would again seem suitable that the issue of who is to be allowed to participate as observers be discussed, at a time when users are sufficiently aware of how the system works to use it well, but not frozen into a "well, I guess it's just the format of this conference" mentality. It is likely that in some situations, it will not be appropriate that any observers participate in a course conference, and if observers are to be invited, it is important for the group to know who the observer is, what role that observer plays in relation to the other group members and to themselves. There is a certain level of freedom that exists when you know exactly who is reading and responding to your ideas, and this level of freedom can be absent if there is anxiety regarding the identity and status of an observer. Obviously there are situations in which invited observers can contribute enormously to the content and flow of a conference, but the presence and role of observers should be an issue to be considered by the group and the moderator, with the understanding that needs differ and in some instances outside participation can be intimidating to some group members. One suggestion on this topic which is of particular value is that group members be able to meet the invited observers, so that they know who they are, and how they relate to the group as a whole.

More went on in our group as we learned to use CoSy than "simply grasping the commands of a particular progam" (p.6). The case study method allowed us to become aware of many of the factors contributing to our comfort level in this learning experience, and it is hoped that the ensuing recommendations will be implemented, so as to provide a more effective learning experience for students involved in similar projects in future semesters.

I would like to express my thanks to fellow members of the group, the moderator and the conference observers, for their participation in the collection of data for this case study.

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Electronic Messaging

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Experiences with the Design and Implementation of the Envoy 100 Messaging System

Dan Oberst
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Interconnecting Electronic Mail Systems: Interim Solutions from Bitnet and Mailnet Experiences

Oscar Stubits
CNCP Telecommunications
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EXPERIENCES WITH THE DESIGN AND IMPLEMENTATION OF THE ENVOY 100 MESSAGING SYSTEM

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ABSTRACT

This paper describes some experiences dealing with the design and implementation of the Envoy 100 messaging system. In particular, the design and implementation of two features, the script and autodelivery capabilities, are discussed. Numerous enhancements have been added to the system and have actually been developed using the script and autodelivery capabilities as building blocks. Some of these are the EnvoyPost feature which allows Envoy 100 users to send messages to any mailing address in North America, the design and implementation of a user maintained and billed information database, and the connection of Envoy 100 with the Perolator delivery system.

Numerous computer systems are currently connected to Envoy 100. Some of the various interfacing methods are described.

Finally, future work in the area of implementation of the new CCITT X.400 series Message Handling Systems Recommendations is discussed. Some of the considerations and possible problems are highlighted.

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INTRODUCTION

Envoy 100 is a public messaging service offered by Telecom Canada, a consortium of ten Canadian telephone companies, including Bell Canada. Envoy 100 has been offered in Canada since 1981 and is supported on Datapac, an X.25 packet switching network. The Envoy 100 service is based on Tandem Non-Stop hardware using the Guardian operating system and application software purchased from GTE-Telenet. The software was significantly modified by Telecom Canada to serve the Canadian messaging market.

Access to Envoy 100 is via standard ASCII asynchronous devices connected to the public switched telephone network (PSTN), the TWX network, or devices directly connected to Datapac. Bulk, non-interactive transfer of messages is also supported using bisynchronous 3780 access.

Introduced in June of 1981, the service is now used by over 600 organizations and 17,000 users. The growth rate of the user base is considerable, with over 400 new users added to the service each month. The applications cover personal and administrative messaging, with some users implementing a mixture of both types.

This paper will discuss some of the features that were implemented on Envoy 100. The features discussed here are some that complement the regular edit, send and read capability of the basic messaging service.

AUTODELIVERY CAPABILITY

One feature that was deemed a requirement for the start of the service was the ability to be able to autodeliver to devices connected to the packet network, the DDD network, or the TWX network. Part of the reason for this was that Bell Canada had a service called MSDS (Message Switching Data Service) which provided the autodelivery capability. This service was going to be phased out and replaced by the more modern hardware and capabilities of Envoy 100. However, the customers of MSDS did not want to relinquish use of it unless they could be assured of the same type of features. Considerable development effort was involved in incorporating autodelivery into the Envoy 100 service and testing the associated hardware.

The basic mode of operation of most messaging systems is mailbox. That is, a user logs onto the system, composes a

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message addressed to another known user of the service, and sends it. Usually, if there is an error in the spelling of the recipient's name, the system will indicate this to the sender, and the message cannot be sent until a valid name is entered into the To field. The system then deposits the message into the mailbox of the recipient. Then, when the recipient logs on, he is able to determine that he has mail and to read it.

The autodelivery capability does not necessarily make use of the mailbox facility and does not require that the recipient be known to the system. It provides a physical delivery of the message to a device based on the network address entered in the To field or in the station's profile if the station is registered. As delivery can occur to either of the three networks mentioned above (packet, PSTN, TWX), some parsing is required.

The user interface for this feature allows the user a number of ways to address a specific device. The simplest method is to merely enter the network address preceded by the network identifier. Following are some examples of the To field for an autodelivery of a message to a specific network address:

To : (NET:20200100)	- sending to a device connected to Datapac
To : (TWX:6105152244,ANS:TORO MKT2)	- sending to a TWX terminal
To : (DDD:6132321111)	- sending to a terminal connected to the telephone network

The second part of the entry for the TWX example above shows the use of the answerback capability for positive verification of delivery. All TWX terminals have this capability, which basically is the ability to send a specific stream of characters to the network whenever prompted for it. The answerback is required whenever sending to a TWX terminal, and is optional for the NET and DDD versions.

Users on Envoy have a great deal of flexibility in the addressing of autodelivery messages, the above examples being but the simplest forms. Other variations include specifying a name just preceding the information given in the To field above, and sending to a registered station name. These versions are described in the Envoy 100 user guide (1).

With all these variations of addressing possibilities, considerable parsing was required in the module which performed

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the sending function. Both the To and CC fields of Envoy 100 can be several lines long, provided each line except the last ends in a comma, and the usernames are separated by commas. The parsing routine recognizes a message to be autodelivered by the presence of the braces. It then matches on NET, TWX, DDD, TLX, or INTLX. After this, it does some general parsing of the network address to ensure that at least the correct number of digits have been entered. The specific parsing varies for each network type, based on the addressing requirements for the network.

It should be mentioned at this point the Envoy 100 is fully bilingual, French and English, and therefore the above parsing is performed for entries in both languages.

The actual physical autodelivery of the message is performed through the network with the use of autodialers. The autodialers chosen for the Envoy 100 service were Vadic autodialers with 212 modem compatibility. There are slight hardware differences between autodialers for the DDD network and those for the TWX network. No autodialers are required for autodelivery to devices attached to the Datapac network, as the packet network is capable of performing all the internal routing and addressing required.

Software modules were required which would be able to handle the specific protocol of the autodialers. Communication and control of the autodialers is handled with certain control characters. One problem that was encountered after autodelivery was implemented was that occasionally these control characters would turn up in messages being autodelivered and would create problems in operation. The worst problem was when a message being autodelivered contained the control character which caused the autodialer to reset and interrupt the current dial sequence. Although the philosophy of Envoy 100 is to provide complete transparency of text for the user, it was necessary to implement a filter to remove any occurrences of the control characters used by the autodialers.

Testing of a capability such as autodelivery can be quite demanding as it is necessary to be able to distinguish when a problem is due to hardware malfunctions or due to software bugs. Initially, the autodelivery software was written in a multi-threaded mode. This greatly added to the complexity of debugging. Since initial implementation of the service, a number of enhancements to the autodelivery capability have been added, such as the ability to send autodelivered messages to the United States via DDD, TWX, or Telex, and the ability to send overseas via Telex. When these enhancements were added, the multithreaded code was replaced by singlethreaded modules designed for the specific networks they were handling.

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SCRIPT CAPABILITY

A feature of Envoy 100 used by many customers is the script capability. This was at one time known as the Tailored Prompt Descriptor feature but is better recognized as the business forms capability.

This feature allows Envoy 100 users to develop preformatted messages tailored to their specific needs. It is suitable for most business applications where there is a repetitive entry process requiring more control over the input and faster delivery electronically. Some applications that have used Envoy scripts are: sales orders, requisitions, control reports, status reports, minutes of meetings, personnel data, purchase orders, etc. The script capability has also been used in other Envoy enhancements which will be described later in this paper.

The script capability basically gives the messaging user the ability to write and execute basic programs at a very high level. The Envoy script capability consists of specific commands which a user can enter into a workspace on the system. There are set rules in the use of these commands, as in any programming language. After entering the commands, the user encodes the workspace. This causes the system to invoke a process which reads every line in the workspace, ensures that the script programming rules have not be violated, and produce another workspace that is an encoded version of the source workspace. If there are any errors, appropriate error indications are presented to the user at that point.

The user can invoke execution of the encoded script by entering

```
compose scriptname
```

where scriptname is the name assigned to the workspace by the user. This command will cause each record in the encoded script to be interpreted by a process which performs the actions requested. Some actions are to produce specific user-tailored prompts, to accept input to these prompts, perform various types of validations on the input, possibly perform conversion of the input (e.g. lower case to upper case), put the input in user-specified positions in a message, and to send the message to pre-defined or user-entered recipients.

Because this script capability is part of a messaging service, it is not possible to make it as powerful as regular computer programming languages without considerable performance

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tradeoffs. As Envoy 100 is a service based on Datapac and initially designed for owners of dumb TTY-type terminals, it is line-based, that is, it displays one line at a time. Thus, it is not possible for the script capability to display an entire form and allow the user to fill in the blanks. The user must be prompted for each input; however, it is possible for the script to place several inputs at various locations on the same line. It is also not possible for the script to perform arithmetic.

A user may maintain sole use of a script, register the script for use by other members of the user's organization, or register the script for use by any user of Envoy 100.

ENVOYPOST

Once Envoy 100 was implemented and offered as a service, a number of business opportunities arose, requiring enhancement of the basic service. One of these was EnvoyPost (2).

As with most electronic mail services, Envoy 100 was restricted to users who had registered for use of the service and were known to the Envoy 100 system by a specific username and password. Message delivery was restricted to mailboxes of registered users or autodelivery to users' terminals or other receiving devices. However, there was a demand for the ability of messaging users to be able to send information electronically (and therefore rapidly) to recipients who were not messaging users and were known only by their regular mailing address. Discussions were begun with the Canada Post Corporation regarding a joint venture to meet this need.

The objective was to modify Envoy 100 to accept messages destined to user's postal addresses and have Envoy autodeliver the messages to Canada Post (CPC) printers located nearest the user's postal code. It was decided that in order to implement the enhancement as speedily and flexibly as possible, use would be made of two already available features of Envoy 100: autodelivery and script.

Rather than writing all the new programs that would be required for this feature in the Tandem TAL programming language, it was decided to write the user interface using the script capability. This provided two immediate advantages. The first was that the user interface could be completed much more quickly. The second advantage was that if any changes were required during testing or during the technical trial, it would be possible to make the changes very quickly. As with all silver linings, there was a disadvantage as well. The script

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commands were very limited and had to be upgraded for some of the technical requirements of this feature.

So, some enhancements were added to the script capability for the specific use of the EnvoyPost feature.

A brief description of the EnvoyPost service will put into context the changes required to the script capability.

In order to send a message (which effectively becomes a letter) to a recipient anywhere in Canada or the United States, the Envoy 100 user would enter the command Compose EnvoyPost. This would invoke the EnvoyPost script which would prompt for the recipient's name, company, street address, city, province, and postal (or zip) code. The user then enters the text of the message. When the user responds Yes to the Send? prompt, the system validates the postal code and puts out a message as follows:

> Postal code K1G 3J4 corresponds to METROPOLITAN OTTAWA AREA
> Is this the correct destination?

If the user responds with Yes, Envoy 100 will then autodeliver the message to the nearest postal station, based on the recipient's postal code.

Based on the above, several enhancements were required to the script capability. The first was to provide a postal code validation command. Another requirement was to have the script maintain a count of the number of text lines entered by the user. This was done to provide spacing at the top and bottom of pages when printed. Also, there is a physical limitation of four pages that can be neatly folded and inserted into the delivery envelope with the delivery address centered in the envelope window. Thus, the script keeps track of lines entered and notifies the user when four pages have been entered. Due to E-Com regulations, the number of pages allowed to the United States is two.

Additional work involved setting up an internal table containing all the FSA'S (Forward Sortation Areas- first 3 letters of the postal code) which was accessed whenever a Canadian EnvoyPost message was sent. These FSA's are linked to the usercodes of the stations in the post office sites, and it is the usercodes that are used internally for routing of the message.

A similar EnvoyPost batch input script is available for users who prepare their inputs offline using either a computer or some storage medium such as a diskette or paper tape. After invoking the script, the file is sent at line speed, and all message posted indications or any error messages (e.g., invalid

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postal code) are logged to an online status file. The status file may be queried after the transmission is complete.

A menu-driven EnvoyPost information summary and postal code directory were also developed using the script capability.

The EnvoyPost enhancement has been very popular with Envoy 100 customers. Currently, EnvoyPost provides delivery to 1,170 Forward Sortation Areas in Canada, extending to towns with populations as small as 1,000 people. Additional locations continue to be added as Canada Post extend their installation of network and printer equipment.

ENVOYCOURIER

Another feature implemented in September 1984 is the EnvoyCourier service which allows users to send messages via courier service to recipients in four Canadian cities. This allows users another delivery option for customers wanting to communicate with non-Envoy 100 recipients. This feature is similar to the EnvoyPost feature described above but is offered in conjunction with Perolator Courier Limited (PCL).

With this feature, the user is led through a prompting sequence similar to EnvoyPost. The user is also prompted for the telephone number of the facsimile macine in a Purolator customer convenience center in the recipient's city. Other prompts are for the consignor and consignee information required for PCL's bill of lading. As is the case with the EnvoyPost script, it is then possible to enter free form text. Envoy 100 then delivers the message as it would any message to a non-accredited station. The message is printed on the PCL facsimile machine, placed in a PCL envelope and delivered within three hours.

This feature is an example of an enhancement made to Envoy 100 which did not require any extensive programming changes. It was implemented by using other available features as building blocks.

STATSCAN

As mentioned above, the Envoy 100 script capability has been useful in many diverse ways. One new feature on Envoy 100 which just became available this month also makes use of the script capability.

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This new feature gives all Envoy 100 users the ability to access information from several Statistics Canada databases. Statistics Canada will have a script registered on Envoy which will contain a variety of information they feel is of interest to the type of messaging users that are on Envoy 100. This script will be updated on a regular basis by Statistics Canada, probably weekly. Any Envoy 100 users wishing to access this script will first need to contact Statistics Canada and be accredited for use of the script. As Statistics Canada intend to bill users for access to this information, they will obtain address information from the user at that time.

From an internal point of view, when users access the Statistics Canada script, script commands will be executed (transparent to the user) to ensure that the user has been registered by Statistics Canada for use of the script information and to make a record of the access in an internal Envoy 100 file. Later the information of accesses by Envoy 100 users is made available to Statistics Canada for billing purposes.

This is a good example of an enhancement on Envoy 100 which will provide more value added service to the users.

COMPUTERS COMMUNICATING WITH ENVOY 100

Although Envoy 100 was designed and implemented to be accessed by ASCII teletypewriter devices, the proliferation of inexpensive personal computers and messaging systems in the last few years have produced an additional type of user of the Envoy 100 service. As well as human users logging onto Envoy with their terminals, there are also computers connecting to Envoy in an automated fashion to send and receive messages, sometimes for the users on the other systems.

One feature of Envoy that is very useful for this is the batch capability. In the interactive mode, when a user enters the command Compose, the user is prompted for the To, CC, Subject, and Text information. Needless to say, this type of interaction, while helpful to a person at a terminal, is a lot of overhead and nuisance when the communication is with another computer. To minimize the interaction, there is another command, Compose Batch, which will have Envoy merely wait for receipt of information in a predefined format. (3)

The users of the Compose Batch capability will generally prepare their messages offline from Envoy 100 in the format required. Then they can use either a semi-automated method of

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sending the information to Envoy 100 or everything can be completely automated.

In the semi-automated method, the user will log onto Envoy 100, as usual, and at the Command? prompt enter C Batch (C is an accepted abbreviation for Compose). Then the user can switch on the file copy mechanism on the remote system (be it a word processor or a personal computer) to send the pre-recorded messages to Envoy 100. The required format of the messages is really exactly identical to that in the interactive mode, but without the prompts.

A more sophisticated technique than the one above is for the user to program his system to automatically call up Envoy and emulate a user by sending the appropriate responses to the Envoy 100 prompts. Most of the Envoy 100 functions can be performed in this type of fashion, for example, Compose, Scan, Read, Status, etc. The Status command is used in order for the user/remote system to be able to obtain a status of all messages sent to Envoy 100, whether they were successfully delivered, and a reason if successful delivery was not possible.

The first application of the above fully automated techniques came when the EnvoyPost feature described previously was implemented. For delivery to recipients in Canada, Envoy 100 autodelivers the messages to Canada Post printers nearest the recipient's postal code. For delivery of EnvoyPost messages to the United States, Envoy 100 places an X.75 call through Datapac and Telenet to a Honeywell computer in New York owned by EMCA, the Electronic Mail Corporation of America. This company provides a service of accepting messages from numerous systems, formatting and bundling them, and sending them on to the United States' post office E-COM service for delivery as first class mail. In the reverse direction, EMCA's subscribers may send messages to the EnvoyPost system. These messages are appropriately formatted and automatically submitted to Envoy 100 by the EMCA computer using a batch input script, after which they form part of the normal EnvoyPost message stream.

At this time, there are numerous computers communicating with Envoy 100. They include Hewlett-Packard, Dec, IBM, and many types of personal computers.

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THE FUTURE : MHS

As described in the previous section, there are currently many computers communicating with Envoy 100. However, they are doing this by emulating a user. This implies certain system overheads and occasional required human intervention. This problem has been addressed by the CCITT (International Consultative Committee on Telegraphy and Telephony) and the recent X.400 series of recommendations on Message Handling Systems fills a need in this area. Like most other electronic mail systems developers, we are looking into implementing these recommendations on Envoy 100. However, there are many issues that need to be addressed in the course of this effort.

Some of these issues will be addressed by the CCITT during their next plenary session. They include questions such as standards for handling directory information among messaging systems.

Other issues stem from the fact that the MHS Recommendations are based on the Open Systems Interconnection 7 layer Reference Model of the International Standards Organization. A Reliable Transfer Service is required in the layers below the Application Layer. Whereas most systems today make use of X.25 at the Network Layer, development work needs to be done in the Presentation, Session, and Transport Layers. Standards have been defined for these layers but they are relatively recent and need to be implemented.

Areas of systems management, performance/availability, and problem tracing between messaging domains need to be addressed. Also, the matter of accounting and billing will probably require some sort of settlement agreement between messaging systems.

Finally, there is the matter of ensuring a common interpretation of the standards. Will the manufacturers or the CCITT be prime in the interpretation of the standards? Is there a requirement for a national/international certification program? Who will perform such a certification?

The above issues should provide many new challenges over the next few years.

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Interconnecting Electronic Mail Systems
Interim Solutions from BITNET and MAILNET Experiences

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Workshop on Computer Conferencing and Electronic Messaging
University of Guelph, Guelph, Canada
January 22-23, 1985

ABSTRACT

EDUCOM, a consortium of 500 colleges and universities, is actively involved in two major university-based electronic mail networks, BITNET and MAILNET. While the evolution and underlying strategies of these networks differ greatly, they have both attempted to make use of existing solutions for inter-university communications.

BITNET, making use of leased lines and a store-and-forward file transfer protocol, links over 400 computers in the U.S., Canada (NETNORTH) and Europe (EARN). One of BITNET's greatest attractions -- making use of off-the-shelf networking code -- has also been one of the greatest impediments. RSCS, while providing a means of file transfer, has not been consistently integrated into mail environments for use throughout BITNET. EDUCOM and the City University of New York are currently setting up a Network Support Center for BITNET, one of whose goals will be to provide end-user and site tools to support this integration.

MAILNET, based on a design developed at the University of Delaware, established a set of protocols and a central polling 'hub' machine which can link virtually any computer with a mail system and a dial-in port. Unlike BITNET, many of the sites had to develop the communications protocol code from scratch, providing link-level and message transfer protocol compatibility with the hub, and a standard message format. Thus, while internal storage and user presentation of mail differed widely among sites, all agreed upon a standard format and protocol for accepting and delivering mail. As a result, over 25 institutions, including 4 in Europe and 2 in Canada, and approximately a dozen different mail and operating systems are now connected in a robust mail network, with gateways in operation to a number of other major networks.

Both networks have taken a very pragmatic approach to interconnecting mail systems: BITNET is making use of a well-defined networking protocol, and MAILNET in adopting protocols already in use by the Computer Science and Arpa communities. Both are investigating alternative protocols at all levels, but are committed to providing communications among the widest possible academic audience.

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INTERNATIONAL MESSAGING

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Workshop on Computer Conferencing and Electronic Messaging
University of Guelph, Guelph, Canada
January 22-23, 1985

ABSTRACT

Over the years, several methods for messaging around the world have been used. The telegram service provided, for a long period, the only written communication other than letters. Telex is, up to now, the most successful service for messaging. It is operated world-wide. It does, however, no longer meet the requirements of all segments of the business. A demand for higher speeds, expanded character set, wider choice of terminals, and an easier search for a destination address has arisen. The newly-approved Message Handling Systems (MHS) standards will go a long way to satisfy this need. A Directory Services study is now in an accelerated process.

The presentation will project the future course - when, who, and how will MHS be implemented. How will the user who has an in-house electronic mail system connect to the outside world. An attempt will be made to provide some insight on what the common carriers, vendors, and some large users with in-house mainframes are thinking.

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EXPERIENCES WITH ELECTRONIC MESSAGE NETWORKING

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ABSTRACT

The MLNET project at the University of Western Ontario involves linking a variety of different mail programs and computer networks. Networking software has been built, and a mail user interface program has been developed for the DECsystem-10 computers on campus. MLNET is an operational system, serving mainly users in UWO, but with the capability to reach other institutions if needed. We survey the state of the MLNET network, and discuss lessons learned during this project.

One of the components of the network is a campus-wide directory system 'MDIR' which provides each participating host computer with a directory of all registered electronic mail users on campus. MDIR also allows messages arriving from off campus to be sent automatically to the appropriate computer and mail box; the sender need only know the receiver's name (enough to be unambiguous). We summarize the architecture of MDIR, and report on what we have learned from the effort to provide this.

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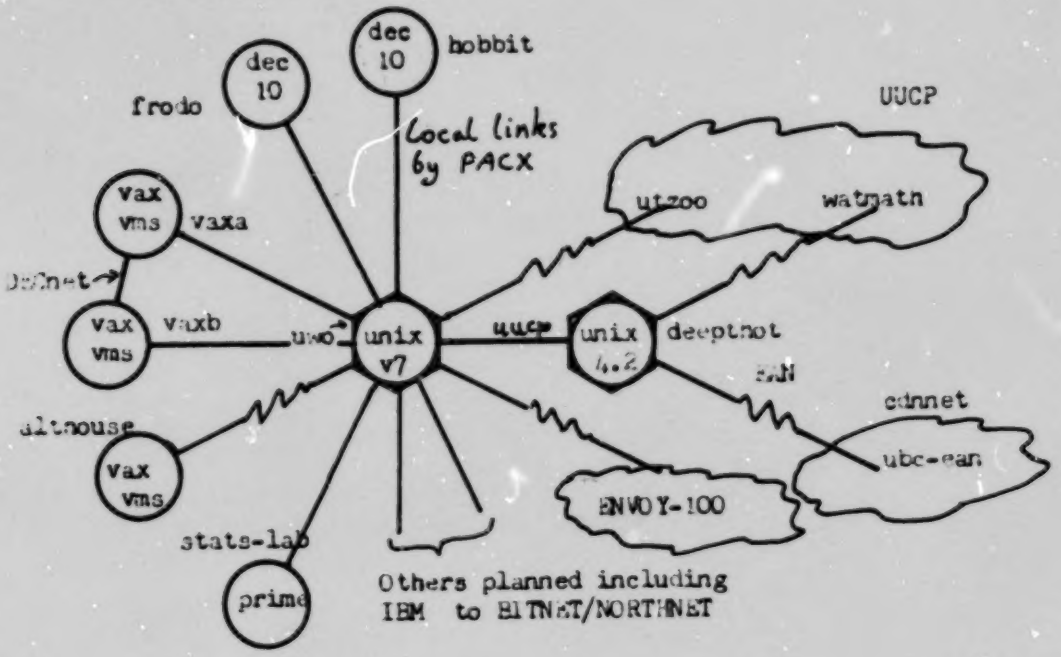
INTRODUCTION

Electronic mail has been in use to a moderate extent for several years at the University of Western Ontario. The past two years have seen marked increases in use of such systems, and an increasing amount of traffic over various networks. The networks include the on-campus MLNET network system, the Unix UUCP network, the EAN software from the University of British Columbia, and the ENVOY-100 message system run by Telecom Canada. Connections with JANET (in the UK), BITNET/NORTHNET and MAILNET (Educom) are also in various stages of planning and/or implementation. Figure 1 shows the current arrangement.



MLNET Connection Topology
Figure 1

Most of the electronic message system users on campus are using one or other of the DECsystem-10 computers, but increasing numbers of people are using personal computers or are using departmental computer systems. The need for message network functions is increasing steadily. There is already a substantial demand for messages to be sent between the two DECsystem-10s on campus.

Electronic mail is fulfilling several purposes. For some people, it replaces or supplements the telephone and postal services, largely for off-campus long-distance communications. For others, the use is mainly or entirely on-campus within their local group, which means often within the same time-shared computer.

The MLNET mail network has been operating pretty reliably since winter 1984; it received fairly intensive use starting in September 1983 when the second

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DECsystem-10 was installed, and the user community of the original machine was divided in two. (In particular, since Computer Science moved onto the 'new' machine, there is much local network traffic between Computer Science and the Computing Centre.)

The MLNET software has also been used to 'bootstrap' two further services, described in more detail later. One of these is a file-transfer service for text files (not for binary information!); the other is the MDIR Mail Directory Server, which maintains a directory of mail users on campus, thereby automating a job that previously required human intervention.

GROWTH OF THE MLNET SYSTEM

The MLNET system has been installed as a production operation at the University of Western Ontario, during the year from Summer 1983 to Summer 1984. An early 'bread-board' version was written earlier, but production running required a suitable computer and the services of a programmer, among other expenses. The Academic Development Fund at Western kindly made a grant available in Spring 1983, to finance this operation.

The net result is that MLNET has been created, made robust and easy to install and maintain, and has demonstrated the practicality of the system. The design and programming for the final system were done by Reg Quinton, while hired for this project. Reg Quinton has now joined the staff of the Computing Centre, and the Computing Centre has undertaken to maintain and develop the campus message network systems.

The majority of people at Western using computer message services are currently using the MAIL program developed at Western for the DECsystem-10s. This program, developed by myself over the last few years, is specific to the DECsystem-10, and its features are much influenced by the local user community. Earlier there was only one DEC-10, but with the acquisition of another in Fall 1983 the networking functions in MAIL and of MLNET received their first heavy load.

Recently there has been some interest in using a 'conferencing' system, and COM is under trial for a limited time. If COM is chosen for continued use, presumably MAIL will be phased out, and MLNET would provide linkage between the two message systems during the period of coexistence.

Table 1 shows in tabular form the levels of use of MAIL on the two DECsystem-10s. The 1090 is the 'general' machine, and the 1091 is the 'computer science' machine.

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Use of MAIL in 1984

Machine:	dec-1090 (frodo)	dec-1091 (hobbit)
Users (typically):	non-CS	CS people
No. of users (total)	753	542
No. of users who sent or received messages	613	485
Messages generated:	31,700	14,200
Messages into network:	1,800† = 6%	3,780 = 27%
Mean # copies per msg	1.5	1.4
No. times Mail run	115,000†	79,000
No. times Mail run that sent or read msgs	37,000† = 33%	23,000 = 29%

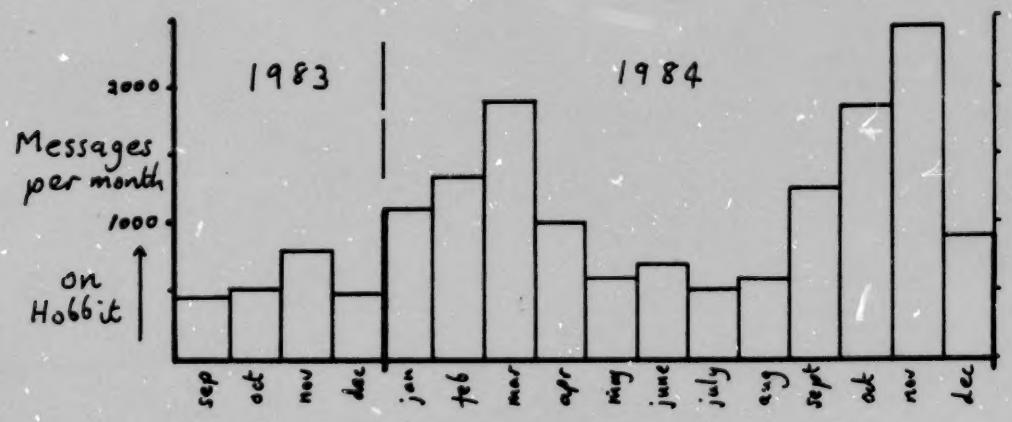
† means extrapolated from partial data

Table 1

Table 1 shows comparatively the levels of use on the two machines, as recorded by metering software. Some of the values for the 1090 are extrapolated, since unfortunately part of the 1984 data were lost.

The CS users of the 1091 are quite prone to use the network, for over a quarter of all messages sent, probably mainly to reach members of the Computing Centre. Users of the 1090 do not use the network so much. The total numbers of MAIL users on the two machines are not very different, but the users of the 1090 on balance appear to send more messages and call on MAIL more often.

Figure 2 shows the numbers of messages generated by users of the 1091 for the individual months of 1984. This chart demonstrates a strong seasonal effect, with less activity outside of the university terms. Many CS faculty now use MAIL as part of their communication options for contact with students; I understand the same thing is happening in other departments.



Messages generated on the 1091, by month of 1984
Figure 2

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Users of the DECsystem-10s originate a large part of the traffic going through MLNET. The other machines on-campus generate an increasing amount of traffic, but not all recent figures were available at the time of writing. Table 2 shows data for the month of May 1984, and Table 3 shows data for December 1984. This shows the relative numbers of messages moved from one machine to another. Curiously, the total number of messages has not changed much, but a lower portion than formerly is 'self'-traffic from uwo to uwo. The system "uwo", by the way, is the message forwarding computer, and also contains the MDIR directory database program. Probably much of the traffic to and from "uwo" is concerned with the directory, since it is not a site of active humans. The "others" category includes remote UUCP systems, Envoy-100, EAN/cdn systems and so on. Some UUCP mail is transferred between deepthot and UUCP without moving to or from other machines on campus: that traffic does not show up in these statistics.

Network Message Flows in May 1984 -- MLNET

	Receiving Machine							
Sender	uwo	hobbit	frodo	vaxa	vaxb	althouse	deepthot	others
uwo	141	55	31	13	0	3	100	52
hobbit	37	2	160	13	0	0	24	5
frodo	24	73	3	3	0	0	9	1
vaxa	2	6	2	11	0	0	11	1
vaxb	0	0	0	1	0	0	0	0
althouse	1	0	0	0	0	0	0	0
deepthot	46	44	17	4	0	0	13	48
others	10	10	1	0	0	0	29	0
totals	261	190	214	45	0	3	186	107

Total Number of Messages = 1006

Table 2

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Network Message Flows in December 1984 -- MLNET

	Receiving Machine							
Sender	uwo	hobbit	frodo	vaxa	vaxb	althouse	deepthot	others
uwo	20	49	54	11	6	0	15	2
hobbit	61	21	289	11	4	0	55	24
frodo	57	147	15	1	0	0	24	9
vaxa	0	3	2	1	1	0	0	0
vaxb	0	3	0	4	2	0	0	0
althouse	0	0	0	0	0	0	0	0
deepthot	10	69	22	5	0	0	5	3
others	17	25	6	0	0	0	4	0
totals	165	317	388	33	13	0	104	38

Total Number of Messages = 1058

Table 3

MESSAGE PROGRAM DESIGN FACTORS

Our experiences with MAIL and MLNET have led us to various conclusions regarding the design and implementation of this kind of utility. Other organizations and groups have generally arrived at similar conclusions, but some of them will bear repeating here.

User Needs

The most basic needs are, obviously, those intrinsic to sending and receiving messages, and dealing with them. Users vary in their experience with computer systems, but a message system must be easy to use, reliable, and secure.

Ease of Use

Message programs sometimes offer a bewildering array of facilities. Users vary in their level of experience, and a user is not necessarily equally experienced in all aspects of the system. Novice users need, typically, a fair amount of prompting as to available actions; experienced users find much prompting distracting and irritating. These diverse needs must be met.

MAIL offers two modes of use: a 'command' mode with little or no prompting, and a 'menu' mode with prompting and restricted capabilities. The 'menu' mode is the default mode for users, unless they indicate differently in their 'profile' file (SWITCH.INI). There is also extensive on-line help available.

COM [Stockholm] and MESSAGE [Michigan-MTS], among other systems, use a related but slightly different approach, which avoids a sharp split between

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two different modes. These systems give a 'partial prompt', i.e. a short prompt of the most likely relevant actions. The user may give a different command, though, and the set of recognised commands is not restricted to those listed in the prompt. That approach compromises well if done sensitively. The novice user receives guidance, and the experienced user does not have to put up with a screen full of prompt text (which is often time-consuming to print too). Nevertheless, experienced users may be mildly irritated by the repeated prompts. Novice users are in a slight danger of mistyping a command and thereby invoking an action which they did not expect and do not understand.

MAIL uses two separate modes to keep experienced and novice users respectively happy and safe. Even so, it does not cater perfectly to the experienced user who needs more guidance on a particular (probably advanced) facility. MAIL merely offers on-line help, but the user may not know what topics are relevant to his or her needs. Probably the best all-round design would be to provide three modes of use: menus for beginners, partial prompting for intermediate users, and little or no prompting for experienced users.

In offering two or more modes of operation, it is important that command or action names are consistent between modes. So the beginning user will learn command names that have the same effect when used in command mode. MAIL does this, of course, and it is easy to switch between modes when desired.

Reliability

Reliable operation of the message utility is important, because users tend to trust a utility once they have got used to it. Adequate operational procedures for file backup, etc., are obviously required. With a network function, it is important to design the communication protocols so that it is clear which entity has responsibility for a message at any particular time. If a machine crashes (as sometimes happens) while a message is in the middle of being transferred between a host computer and a network machine, care should be taken the the message will probably survive.

In MLNET we have coded the communication protocols so that in the case of a crash, we are more likely (rarely) to end up delivering two copies of a message rather than none. (This did happen occasionally, during MLNET development, to the puzzlement of the recipient! Annoyance was usually soothed by the explanation that we were 'playing it safe'.)

Reliability also means that any communication links should, if at all possible, use error detection procedures, such as checksums, with retransmission if possible after an error. This is a difficult problem in the MLNET context, where the protocols are deliberately intended to function with a variety of machines, possibly using Mail programs that have no knowledge of the network.

The MLNET links to the DECsystem-10 computers at first did not use any error detection. That capability was added, however, when some users complained of receiving corrupted messages. Actually soon after the error detection procedures were installed for those links, they enabled us to track down a

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puzzling problem whereby some messages which had been encrypted could not be decrypted again. It turned out that owing to a coding oversight, an encrypted message text might rarely contain "RUBOUT" characters, and these (unexpected) characters were causing loss of unpredictable amounts of (cipher) text on the link. The moral is: **use some kind of error detection**, even if the links are expected to be noise-free.

Another reliability issue, from the user's point of view, is having some way to check on whether messages have been received. When a message is important, the sender should be able to make it 'registered': that is, a receipt will be returned when the message is delivered, and the networks (if any) should maintain an 'audit trail' for the message so that it can be traced if necessary.

Related to the above is another desirable feature of a message program. If a message is not successfully delivered after a significant delay (perhaps one week or one month, possibly as specified by the sender) then the sender should be notified of that failure.

Security

A third need from a message system is for adequate security. Attitudes to security vary between different communities; for instance Unix machines often operate on the principle of making almost anything readable, and being careful mainly to limit write access to files by others. Security of message systems includes (i) preventing messages from being damaged by other people, (ii) preventing messages from being read by unauthorized people, and (iii) validation: have some assurance that a message comes from the person it seems to have come from.

As far as the MLNET system is concerned, security is preserved mainly by using a distinct system for the network functions, and limiting direct access to that machine to the relevant staff. The connections MLNET makes with other machines are validated by the passwords needed to contact those machines on the appropriate channels or accounts.

The MAIL program on the DECsystem-10 computers has problems with internal security, because the file system of the DECsystem-10 operating system (TOPS-10) does not provide fine enough access control to files. The Mail Box files that each user owns are the source of security problems. Any file protection allowing messages to be put into a mail box by MAIL will also allow users to write their own programs to read or even modify data already in the mail box. The only readily available solution would be to make MAIL a 'privileged' program. That, however, is dangerous because MAIL includes facilities to read and write user-named files, and if the whole program were privileged these facilities would enable almost arbitrary access to other people's files regardless of their protection codes!

The solution to this problem has been to encrypt message contents. MAIL includes an encryption/decryption module, and it can be called on in two different ways.

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Encryption can be 'automatic' and relatively invisible, or it can be user-selected with a user-specified key. By default messages are not encrypted. But a user can turn on automatic encryption for him or herself, and can specify that a particular message being sent is to be encrypted with a given key. When a user turns on automatic encryption, all messages sent by her or him, and those arriving in her or his box, are encrypted with a fixed system-defined key (except for those which have a sender-specified key).

These measures were introduced especially because the Computing Centre at Western started to use MAIL for 'official' communications, at least internally, and it was not acceptable that the contents of mail boxes could be read by anyone other than the owners. Many staff members now have the automatic encryption turned on permanently. This offers protection at least against 'casual snooping'. With some trouble, a determined programmer can arrange to decode a copy of another person's mail box, at least for the auto-encrypted messages in it, though MAIL will detect unsophisticated attempts to do this!

For more security in particular cases, messages can be marked as 'Confidential', and the sender then has to supply an encryption key. This key is not stored anywhere in the system, and has to be made known to the receivers before they can read the message. This, therefore, provides a higher degree of protection against unauthorized reading of messages; it also offers some assurance that the message is not forged, since the forger would not know the correct key.

The encryption method is not a total solution to the security problem in this case. It does not stop a malicious user from damaging the contents of another person's mail box. 'Confidential' messages can still be read if the 'spy' invests in cryptanalysis. That would be tedious, but in the bounds of practicality, since the encryption algorithm is not very sophisticated; even as it is using encryption doubles the time taken to read or write a message, and it is not obvious what trade-off is reasonable here.

Users can protect themselves further, in practice, by moving messages frequently to save folders. The save folder files are not normally accessible to anyone else.

Information which is very sensitive should be encrypted by the sender using a more sophisticated utility, and similarly decrypted later. It would be nice if TOPS-10 had a less crude file protection scheme, such as a capability scheme, or the ability to identify named programs as permitted access to the mail box files.§

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§ There is an optional feature in TOPS-10 called the File Daemon that provides this more flexible access control, but it is not used at Western. It is considered to be too expensive in processor overheads.

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ADDITIONAL NEEDS

The message system must meet other needs in practical use. What follows is not exhaustive, but covers some points which are not always provided by such programs.

Organising Saved Messages

Some users hardly ever save messages, but others do keep messages on file for future reference. It isn't long before a user might have some hundreds of saved messages in her or his 'electronic filing cabinet'. Ideally, these messages would be indexed in several different ways for ready access and browsing through.

A common method of organizing saved messages is in user-defined 'folders' with various names. This can be regarded as indexing according to a single assigned 'keyword' -- the folder name. Typically each 'folder' is actually a separate disk file containing a series of messages.

Other methods by which messages might be retrieved are:

1. By id: each message should have an identification code or number which is unique;

2. By sender, receiver(s), or by subject text: This involves in general a text search/matching on a substring of the field concerned. Retrieval checking can be expensive, though methods have been proposed to make this kind of checking more efficient.

3. By date of the message: checking before and after limits. This can be done efficiently if the date stamp in the message is parsed once and the result stored for future reference.

4. By references. This implies keeping, in some form, chains of pointers (forwards and backwards) between different messages to show which are responses etc. to which others. This facility can only be implemented efficiently if the messages are stored in some kind of indexed data base, rather than merely written into sequential files. COSY and COM provide this kind of system, for example.

There is a need for more studies in how people access messages, and for implementing systems which are flexible in supporting many different patterns. Different people probably prefer differing strategies for this problem.

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Deferred Delivery

One of the more persistent requests from users of MAIL (once the network, save folders and encryption facilities had been provided) was to allow deferred delivery of messages. That is, a message can be marked for delivery not immediately but rather at a later time. The message might be to oneself, as a reminder facility, or it might be to another person.

This facility was provided, relatively recently. What was obvious is that the ease of implementing this depends on how the system stores messages before they are delivered. That topic is discussed in a later section.

Distribution Lists

In a system for 'mail', it often happens that several messages have to go to the same list of receivers. It becomes desirable to be able to give a symbolic name to such a list of receiver names.

In a 'conferencing' system, such as COM [Stockholm], FORUM [UBC-MTS], or COSY [Guelph], distribution lists can be regarded as effectively a form of Closed conference: that is, a discussion with a specific list of participants. Conferencing systems get an efficiency advantage of needing to keep only one copy of a message in the message store, regardless of how many receivers there are at that computer. Nevertheless, this advantage dwindles as the message system becomes increasingly distributed over many different machines.

In a network environment, there is an increasing problem (in 'conferencing' systems) of avoiding sending messages to systems where they are not needed. This problem is particularly acute, for example, in the USENET environment. USENET potentially floods its systems with a large amount of traffic, much of which may not really be needed at most of the hosts. A ball-park figure of 100 Kbytes of text a day has been quoted. This traffic fills disk space rapidly, and keeps communication lines busy too.

Automatic Forwarding of Messages

I rate it very important that a message system includes a capability for forwarding messages automatically from a particular mail box. As people move posts and roles within and between organizations, they will have to relocate their mail boxes from time to time.

To some extent, revising the destination address for a person can be handled within the directory service. If the directory entry changes, mail will automatically be sent directly to the appropriate new place.

However, it is not entirely solved by the directory service. For one thing, revised directory data may take a while to percolate, especially in a distributed network environment. For another, some people may have (effectively) directory information in private files, which is not updated automatically by the directory service.

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This is a problem which may not emerge within the first months of a message system's use, but will definitely become a problem as the years go by. It is important, of course, that the automatic forwarding system works with mail arriving from either local users or from the network connections, and that mail can be redirected to an address elsewhere on the network(s).

When mail is redirected automatically, it is desirable that notification of this redirection be included in the message itself, and also sent back to the original sender. The sender will need to know so that future messages can be sent to the new location.

A potential problem arises with redirection to a different network host computer. It is possible accidentally to create a loop of redirections, so that the message starts circulating endlessly between several different computers. The best way to handle this is to mark the message each time it is redirected, and to have some limit on the number of redirections permitted. This is easily enforced within any one computer, but takes more cooperation to achieve in the network forwarding case.

An alternative approach is for each system to reject a message which has already been forwarded by itself. The X.420 specification is more restrictive, and says in effect that a message may only be auto-forwarded once.

Automatic Responses to Messages

It is a useful feature, though not essential, to be able to set an automatic response message. This means that anyone sending you mail will receive the response message right away. The response message is useful when you are going to be away for a while; it notifies others that they should not expect an immediate reply from you. E.g.

Away for 22-23 Jan. TQ [julian]

MAIL's automatic response feature only works effectively for senders and receivers on the same computer: the response is printed by MAIL on the sender's terminal at once. However, if the message has been delivered via the network, that response will not normally be returned to the sender. MLNET will return the response, as part of the receipt, if the message has been marked as Registered.

EAN [UBC] has essentially the same feature except that the response is sent back in a 'proper' mail message, and therefore will be delivered even over a network connection. That does cost more in overheads though. Doubtless users would like to see the automatic response before they compose their messages; some messages would not be sent if the author knew the recipient is out of town. That is something which could be provided by an enhanced PROBE service in X.400/X.411/X.420.

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NETWORKING AND IDENTIFICATION OF USERS

In a small closed community of computer users, it was acceptable to identify people (for the purposes of messages) by their computer ids. This is no longer appropriate, however, as the computers support larger communities and themselves are linked by networks. Considerable discussion has taken place in the last year or two, for instance in IFIP Working Group 6.5, on how to identify people for message systems, and on what services should be provided by the directory.

In building MLNET, one of the most obstinate obstacles to achieving a satisfactory user interface is when a message program is not built for networking. In such a case, a user will unavoidably have to use some slightly cryptic codes in the typed message to get it delivered elsewhere, bypassing the message program's own restricted mechanisms. Occasionally this can be achieved by the facilities of the command programming language, even when the message program is available only as binaries.

It is far preferable, however, to incorporate some knowledge (however primaeval) of network addresses into the message program. In particular, this is necessary if the Reply command is going to work with a message that has arrived from a remote sender. Similarly, any automatic forwarding over the network involves giving the message program some knowledge of the network.

Names, Addresses, and Aliasses

IFIP WG6.5 has developed a model for directory service functions. It involves distinguishing three concepts: an O/R address, an O/R name, and user attributes. The prefix O/R stands for 'Originator/Recipient'. An O/R address is a unique machine-oriented value which identifies where a person's mail box or message program is to be found. For instance, it may include a computer login id, as well as an identification name or number for the computer, or a network address.

An O/R Name is a unique identification for the person, but it is supposed to be composed of such things as his or her last name, initials, and so on. The intention is that people might be able to remember your O/R name, and you can have it printed on your business cards in much the same way you put your telephone number there. (It will be a little while, of course, before the systems are standardized enough for this to happen. What people currently tell their colleagues is most often in effect an O/R address for themselves.)

Thirdly, a message user might be identified by User Attributes. This means that you know some things about the person, such as name, first initial, home phone number, or work address; and you need to find out what their O/R Name is. The directory service should be able to take what information you have, partial and fragmentary, and help you identify just which person you meant and then supply the correct O/R Name.

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It is intended that the directory service can also accept an O/R name and produce the corresponding O/R Address. However, the intention is that the lookup is not normally provided to humans. This is partly because the O/R address may be subject to change, and partly because it should not be anyone else's business exactly what your network address and login id (etc.) are.

Current message systems go some way towards making the naming and addressing system manageable through use of Aliasses. An alias is a symbolic name, which is translated into the correct O/R address from a database of aliasses. To that extent, an alias is a form of O/R name. However, aliasses are of essentially local significance, and there are no agreements or rules in sight for giving them the global significance and portability that O/R Names should have. (A case can be made for keeping it like that too. There would be the same scope for abuse of O/R names that Social Insurance Numbers (SIN) offer, in connection with tracking the activities of individuals, for example!)

The approach adopted in MAIL on the DECsystem-10 is to provide a system-wide Alias file that each user accesses automatically when needed. Mechanisms are defined so that a user can keep his or her own private supplement of alias definitions, and so that a group of users can have a common supplement similarly. These supplementary alias definitions may be for people who have not yet registered for the global list (perhaps because of inertia, or because they prefer to remain ex directory), or for people elsewhere (and therefore not registered locally). The various alias definition files can also include definitions of names for Distribution Lists.

In a message system it is necessary to adopt some fairly uniform conventions for representing names and addresses. Until a new CCITT system becomes standard, the ARPAnet approach seems the best method for specifying addresses. (I consider the RFC-822 forms to be addresses rather than names, though they come somewhere in between in terms of the X.400 model.)

In MLNET we adopted the ARPAnet forms, anyway, which go

name@host.domain

for instance

djmdavies@uwo-hobbit.mlnet

It is possible to name several domains, which are assumed to be successive levels in a hierarchy of subdomains, as in

djmdavies@hobbit.uwo.cdn

This syntax has been 'bent' a bit to handle also UUCP addresses, which carry explicit routing information. In UUCP, addresses look something like

a!b!c!host!user

where the user is at host but the message has to be routed through hosts a, b and c in turn. We represent that address, within MLNET, by

user@host.c.b.a.UUCP

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The order of the hosts is simply reversed. The justification for this is that it is practical, and that as the message goes down the delivery route, we treat each successive host as a 'subdomain' of its predecessor. Various software projects are under way to automate UUCP routing, so that such an address can be given as merely user@host.UUCP with a database supplying an appropriate route. The EAN/UUCP gateway from UBC contains such a mechanism for example.

Alias Matching, Disambiguation, and Spelling Correction

A practical issue arises in the routines to look up an alias. I am registered in the system directory with the alias "Julian Davies" (among others). At present, there are no other people called Julian registered in the directory. MAIL will therefore accept the input "julian", and remarks on seeing it

[Assuming you mean Julian Davies]

When another Julian Somebody registers, the input "julian" will no longer be unambiguous, and MAIL will offer the various matching aliasses in turn until the user identifies the one they meant.

In MAIL, if none of the matching aliasses was correct, or if none match, the program offers an opportunity to retype the name; the problem may have been a typing mistake in the first place. There is scope here for a spelling corrector module which takes account of the known patterns of typical typos (transpositions, perseverations, etc.)

Care is needed in the design of the routines to look up the alias list; as noted earlier, some 1000 different people have used MAIL during the last year, and the system alias file itself contains about 370 definitions. (Many student users on course projects did not register with MDIR.) There is a danger of overwhelming a person with screen loads of names if the matching rules are too loose. In MAIL, we require that the text typed be a substring of the complete alias, and not starting or finishing in the middle of a word. That is, if the user types Mary, MAIL will not pick out Maryanne as a possible match, though Mary Anne is a match.

ORGANIZATION OF THE MESSAGE STORE

One of the major design decisions needed for a message system is how to organize the message store: both for messages pending delivery, and for messages after they have been delivered. In fact, it is an important decision whether to keep undelivered and delivered messages together or separately.

Taking the latter decision first, there are two cases in which the undelivered messages and the delivered messages are kept completely separate. One is when the CCITT X.400 model is being followed 'literally', with each separate user having a private individual User Agent. The CCITT

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model makes a sharp distinction between the User Agent Layer (which contains user-run software) and the Message Transfer Layer (which gets messages from one user agent to another). At any particular time, for a particular message, one and only one of these layers has responsibility for the message. Messages pass from the transfer layer to the user agent layer as they are 'delivered'; obviously the layers have distinct storage structures.

The other case is architecturally isomorphic with that summarized above. When every user has a separate workstation with its own file store, messages have to go from one station to another as they are delivered. We could say that the user agent is in the user's workstation, and the message transfer agents are in other systems, such as network servers. Doubtless this physical configuration was influential in the definition of the CCITT model.

In universities we often have to deal with time-shared systems. Also, recent years have given rise to local area networks (such as Ethernet or the Cambridge Ring) where workstations on the network share file servers and other servers, maybe even a message server.

In these cases, it is possible (so far as the physical architecture is concerned) for several users to share a common message store, and undelivered messages may or may not be sharply segregated from those which have been delivered.

Two cases are often found. First, a common system is to have a separate mail box file for each user, which receives unread messages. Messages are usually moved into other private files (save folders) once they have been read. This scheme is found in Unix, MAIL, and numerous other systems. The usual alternative to that is to have a central database of all messages; for each user a file is kept indicating which messages are waiting to be read, and which have been read and are still available to that user.

The 'central file-store' scheme has several advantages on time-shared systems. It treats mail as a special type of private conferencing activity, as in COSY and COM. In so doing, it allows the more sophisticated indexing and retrieval schemes discussed earlier to be provided on the central database. Also, it avoids duplication of messages in files when the same message is sent to several people. Data collected from MAIL indicates that some messages go to quite a few different people, and on average there are about 1.4 to 1.6 times as many individual messages delivered as there are distinct messages. In some cases (connected with courses) messages go to 50 or 100 different people. It is certainly inefficient in computer time and disk storage to replicate the same text in numerous different mail box files.

Other reasons for having a central message store (which might be in a specific message server station on the local area network) are: for implementing deferred delivery; and in checking for messages that go undelivered for substantial periods. Both of these facilities were mentioned earlier. Deferred delivery was requested repeatedly by an enthusiastic minority of mail users on campus, for a 'reminder' function. Notification of undelivered messages contributes to perceptions of the system's reliability.

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It appears that the CCITT model needs further clarification, or interpretation, to explain how to make this kind of system fit in with the model. One approach to resolving this would be to regard the entire message store system as a giant User Agent which is shared between the different users. However that conflicts with the model assumption that each user has a private user agent, and that each user agent acts on behalf of a specific user. Delivery of a message to the user agent is considered tantamount to delivering it to the user, for instance.

Within a time-shared system, such as the DECsystem-10, there are two reasons why a system of separate mail box files might be preferred. First, it makes each user accountable for the disk storage they are using. This is a point in favour of private folder files or message stores (rather than a communal store) where disk storage is charged for or limited by quota. Secondly, it avoids the need for a database with appropriate access controls; but this is a weak reason, since database access technology is well understood, and there can be access control problems anyway.

If I were redesigning MAIL now, I would use a central file store for messages, to avoid duplicated information, to provide people with access to messages they sent at no extra cost, to implement deferred delivery elegantly, and to provide better cross-indexing (as found in COM and COSY). Relating this kind of system to the CCITT model remains "for further study".

FILE TRANSFER BY MAIL

At Western we have a variety of computers, and hitherto very little in the way of network software to support information transfer. By the time the MLNET system was running, there was still essentially no other readily available method for moving information from one computer to another. Even the DECsystem-10s were not connected together, nor with the VAX/VMS systems, though there was a vendor package for this: DECnet. Unfortunately, DECnet cost too much because of the communications hardware for synchronous lines that would have to be added.

Almost immediately, people started using MAIL and MLNET to move text files from one machine to another. Therefore we implemented a file transfer facility which uses MLNET as a transport medium. Two senior students developed appropriate software: Lu Kok Meng for the VAX/VMS machines, and Brian Ho for the DECsystem-10s. In each case, one program accepts a file transfer request, and sends off appropriate mail messages; another process on each machine runs autonomously, and processes the arriving mail messages.

The mail messages contain file names, account names, and relevant passwords, as well as the file data to be moved. This information must all be safeguarded carefully. We therefore use encryption with an individual randomly generated 'session key' for each separate message. The key itself appears at the start of the message, encrypted by a fixed system-defined key.

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This two-key system is designed to deter potential cryptanalysts. The session keys are random, and have randomly varying lengths (within limits) thus making it worthless to pool several messages to collect more data for cryptanalysis. The encryption method chosen (like that in MAIL) is not very powerful (not comparable to DES for instance) so a determined cryptanalyst with plenty of computer time will be able to 'break' a message. However, the level of security is thought enough for a typical university environment. The main weakness is that once the system-defined key is discovered, any message can then be decoded thus revealing some user's password (even if nothing else of great interest).

This system has been running regularly since Spring 1984, when Glenn Kubik cleaned up some loose ends of establishing appropriate accounts, etc.

THE MDIR DIRECTORY

It has been mentioned earlier that we are running a campus-wide directory system called MDIR. This allows users of any of the MLNET machines to register themselves, to query the directory, and to change or delete information for themselves. The directory information is automatically distributed to the various computers (once a day, when there have been changes).

MDIR is essentially a centralized system, with one master database kept on the host uwo. All requests for changes and information go to uwo, as mail messages to a special user. The database software sends back mail messages with its answers or confirmations. The contents of the database is also distributed (as mentioned) en block to the message programs on the various machines, as appropriately formatted alias definition files.

At present, only the DECsystem-10s and the unix machines make effective use of the alias definition files, but these handle nearly all the mail users anyway. The other machines can be served also as soon as their user communities find it worthwhile to figure out how to use a system alias file! The alias files themselves are distributed by the file transfer system or by UUCP file transfer, as relevant.

The information in the database consists of triples: three text strings associated together for one entry. The components are: (a) an alias, which is required to be unique in the directory; (b) extra comment text; and (c) the actual mail box address. For instance, an entry might go

(a) Julian Davies
(b) Computer Science, UWO
(c) 4050-352@uwo-hobbit.MLNET

This is massaged in various ways, depending on which system it is sent to. For example, DECsystem-10 MAIL aliasses may be composed of several words separated by spaces, whereas aliasses on unix systems may not contain blanks.

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Each mail program has immediate access to its system alias file, distributed by the MDIR database processes, so aliasses can be translated directly into addresses, perhaps after interactive disambiguation, spelling correction, etc., as needed. The mail program has no need to contact MDIR in mid-action, over the network. This design is constrained, of course, by the lack of fast network connections for processes in different computers to talk to each other on request.

MDIR has only been running for a few months; it was completed towards the end of Summer 1984. The detailed design and implementation work was done by Glenn Kubik, with support from an NSERC Summer Scholarship.

I mentioned that MDIR communicates with the users via mail messages. Glenn has also built a 'front end' program for DEC-10 users to present their requests. This was built after consultation with the member of Computing Centre staff who used to handle all registration requests manually. It detects the commoner user errors, and guides the user with a menu, so it is pretty much self-explanatory. The combination of automatic database and user interface program appears to have made a successful and useful package.

One of the benefits of the MDIR system is to eliminate a tedious chore previously done by a human with a text editor. Another is that the system will extend to other MLNET computers as they are added, without requiring system administrators on those other machines to work on their own alias files too. Those computers only need to establish procedures for automatic reception of the alias definitions.

Another benefit, a corollary of the above, is that the computers uwo and deepthot both have the complete database on hand. These two computers are the gateways between the campus and MLNET networks, and the rest of the world (such as UUCP and EAN). Since the MDIR program hides the precise details of the mail box address behind a more easily remembered alias or name, people off campus on other networks can readily mail to users on campus without needing to know where the mail box is. It is sufficient to know the alias, such as in

julian#davies@uwo.MLNET

And if that user changes the location of his mail box on campus, correspondents off campus do not need to know.

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Computer Conferencing Applications

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Reactions of Scientists to the Structure and Contact of an International Computer-Based Conference

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Reactions of Scientists to the Structure and Contact of an International Computer-Based Conference.

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presented at the
Workshop on Computer Conferencing and Electronic Mail
University of Guelph, Guelph, Canada
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ABSTRACT

Scientists who participated in a computer-based conference were asked to comment on the technology itself and on the scientific value of the exercise. While 78% of the 97 respondents indicated that they would participate in other computer-based conferences, they also identified improvements that they would like to see. There was particular concern about the lack of contribution by participants, the quality of the information that was presented, and an absence of focus or direction to the conference. Some of the difficulties would be minimized by changes in features of the conferencing system. Recommendations for future conferences are made, based on the problems identified by the participants. Many of the problems require social, not technical solutions.

INTRODUCTION

The computer-based conference described in this report was titled "Computer Conference on Bioconversion of Lignocellulose for Fuel, Fodder and Food needed for Rural Development in Poor Countries." The conference was organized by the International Development Research Centre (IDRC), a Canadian organization based in Ottawa and dedicated to facilitating the research of scientists in developing countries. IDRC saw computer-based conferencing as a method of bringing the developing-country scientists into direct communication with their industrialized-country colleagues. The topic of the conference was selected because applied research in the bioconversion area is ongoing, not only in the industrialized countries, but in the developing countries as well. The conference was considered from its conceptualization to be an "experiment" or field trial that had two purposes: technical and scientific. As a technical experiment, the planners wanted to assess the viability of using computer-based conferencing as the method of communication among widely dispersed scientists, some from developing countries. As a scientific experiment, they were interested in the actual content of the conference proceedings -- whether or not it contained valuable or useful scientific information.

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The conference was carried out simultaneously on two different host systems, The Electronic Information Exchange System (EIES) at the New Jersey Institute of Technology and COM at the University of Stockholm Computing Centre. Arrangements were also made for interested scientists who were unable to communicate with either of these systems to participate off-line through TELEX and mail. These individuals would receive copies of the proceedings by mail and were encouraged to send their comments to IDRC by TELEX to be entered into the conference.

A comprehensive evaluation of the converence (Balson, in press) is available; it contains reports from several key persons involved in the conference, as well as three evaluation reports funded by United Nations University. These reports examined the actual proceedings of the conference, the technical difficulties encountered by scientists attempting to use the system, and the scientists' perceptions of the conference based on responses to a questionnaire. I conducted the evaluation of scientists' perceptions based on the questionnaire data and statements made by key conference participants (organizers and scientists) in various group discussions.

METHOD

Questionnaire Design

The objectives of the evaluation of the computer conference on bioconversion of lignocellulosics for fuel, fodder, and food were established by a meeting of the Evaluation Planning Committee sponsored by IDRC. In the meeting, it was decided that the main purpose of the evaluation was to determine whether the participants considered the conference to be a success along two dimensions: first, with respect to the technology itself, and second, with respect to its scientific value. Not only was the evaluation to provide information relevant to a decision on whether or not to hold a computer conference, it was also to make recommendations for improvement of computer conferences in the future. It is this aspect of the evaluation which will be the major focus of this report.

Subjects

Letters were sent to 541 scientists, 80 of them from developing countries, inviting them to participate in the bioconversion conference. Twenty-two percent of those from the industrialized countries and 31 percent from the developing countries accepted the invitation. Due to this low rate of participation, we tried to determine reasons for nonparticipation by these groups. Consequently, a one page questionnaire was sent to 178 invitees who had not participated in the conference. This list included all of the invited participants from developing countries who had not participated as well as 128 selected at random from the invitees in the industrialized countries. Thirty-five questionnaires were completed by the developing country nonparticipants

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and 67 were completed by the industrialized country nonparticipants.

Questionnaires evaluating the computer conference were mailed to all individuals on a master list furnished by IDRC. A 72% rate of return was achieved. Some of the nonrespondents may have been nonparticipants because the IDRC list contained potential rather than known participants. Returns were obtained for 80 on-line participants and 17 off-line participants. Responses were obtained from 15 developing country participants of whom only four were on-line. Thus, the ability to involve developing country scientists in the conference was not great.

RESULTS

Conference Participation

The conference was conducted for seven months ending in December of 1983. Utilization statistics showed that the number of comments contributed per month was 50 or fewer, with the exception of the last month when approximately 300 comments were entered. This increased activity can be attributed primarily to dispersed workshops that involved both face-to-face and computer communication sponsored by the COM group in Europe. Groups held discussions at different locations on planned topics and entered summaries of their discussions into the conference. Most of the conference comments in December were connected with either the planning or the content of this workshop. Because users were asked to fill out the questionnaire at the end of December, the ratings of those participants involved in this phase would be influenced by this activity.

Respondents were asked to estimate their participation in the conference. While the majority read 75% or more of the conference, only 22% considered themselves to be regular contributors. Thus, there were many more regular readers than regular contributors to the conference.

On-line participants were also asked whether they received assistance in getting printouts and typing their conference comments. Thirty four percent of the respondents never used the system themselves while 44% always did their own work. Those who never used the system personally were more likely to be infrequent users of the conferencing system. Members of this group represented 12% of the regular users, 44% of the occasional users and 50% of those who never contributed. In addition this group contained only 17% of those who read most of the conference and 50% of those who did not. Thus, those who received assistance in using the system were less likely to have a high level of participation in the conference.

A major point of interest in judging participant reaction to the conference was the following question: "If you were invited to participate in another computer conference on a topic of interest to you in the near future, do you feel you would participate?" This question was answered as "Yes", "Uncertain"

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or "No" by 78%, 16%, and 6% of all respondents respectively. All of the developing country participants were willing to participate in the future, while 75% of the industrialized country participants gave a positive response. Thus, in general, most of the participants indicated an interest in participating in future computer conferences.

Questionnaire Items

Responses of Nonparticipants. The questionnaire used for nonparticipants contained 18 statements of problems which might prevent participation in the conference. The respondents rated these statements on a five point scale; a response of one was used to indicate that the respondent considered the item to be "not at all a problem" while a response of five indicated "major problem".

Considering first the responses of participants from industrialized countries, only one item, "other scientific activities took higher priority" was given a rating of three or more by a majority (76%). In contrast, three items were rated as three or greater by a majority of developing country participants. These were "costs of participation" (83%), "difficulties with the telecommunication link" (69%) and "difficulties with access to a computer terminal" (69%).

Time constraints were a greater problem for those in the industrialized countries, while difficulties with costs, the telecommunication link and access to a terminal had higher mean ratings for the developing country participants. The difference in the mean rating scores for the industrialized and developing countries were statistically significant for these measures at the 1% level of significance. In addition, one other item -- "administrative difficulties" -- had a significantly higher mean rating for the developing than the industrialized countries using the 1% level. This item was concerned with "red tape" encountered in attempting to get approval to participate in the conference.

Responses of Participants. The questionnaires contained items concerned with the quality of information obtained in the conference in addition to the items found on the nonparticipants' questionnaire. Items receiving a rating of three or greater by the majority of developing country participants are "difficulties with the telecommunication link" (77%), "other scientific activities have a higher priority"(55%), and "difficulties with access to a terminal" (54%). The item, "costs of participation", received three or more on the part of 49% of the respondents. Thus, the concerns of the developing country participants were quite similar to those of nonparticipants. It should be remembered that 11 of 15 developing country participants were unable to participate on-line. Thus, the importance of the technical factors in reducing their opportunity to participate was not unexpected.

Participants in the industrialized countries were more concerned about the quality and quantity of information than technical factors. A number of items were given responses of three or more by the majority of respondents. These

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were "there was repetition in the comments (78%), "other activities have higher priority" (74%), "most participants are unwilling to share ideas" (64%), "lack of response to contributions" (61%), "I was concerned about the accuracy of information" (65%), "it was difficult to find the comments of interest to me" (59%), "too much information" (55%), "the items I have received do not seem worth reading" (53%), "I was reluctant to contribute to such an open conference" (51%). One of the items, "too much information", was often changed on the questionnaire to read "too much low quality information". The respondents from industrialized countries were clearly concerned about the lack of quality control on the information that was present and the lack of substantial contributions. A factor affecting the lack of contributions appears to be an unwillingness to share ideas and unpublished work.

Content Analysis of Respondents' Comments. The questionnaire contained a number of open-ended questions. Questions asking respondents to list "Other factors" (e.g., "Other factors limiting your participation") were answered by about 20% of the participants. The most frequently expressed problem centered on content. There was a great deal of concern for the quality of the material. Poor content was mentioned 21 times and, more specifically, "junk mail" was mentioned 7 times. Poor participation by others, time constraints and costs were also frequently mentioned as drawbacks to the conference. The most frequent positive comment, made by 11 respondents, was that the participant got a chance to learn about computer conferencing.

Response to one open-ended question was of particular interest. Participants were asked to suggest changes for future conferences. Almost half of the respondents (49%) suggested changes.

Three major themes were highly represented in these suggestions. These were (1) methods of providing more direction and focus to the conference (N = 24); (2) methods of increasing participation (N = 15); and (3) ideas of how the conference chairmen should be involved (N = 14).

The suggestions concerned with methods of giving the conference more focus and direction were: confine the conference to narrower topics (8); do more planning before the conference (8); and increase the intensity of the conference (6). This last category contained one suggestion for a very short conference introduced through a series of prepared papers. Other suggestions for the best use of the workshop activity involved having it earlier or in the middle, rather than at the end.

Of the comments about more participation, three suggested more assistance to the participants; three suggested that more experts should be involved; and three asked for more developing country participation. Four suggested the use of publications or some other form of recognition to encourage greater participation.

In the items where leadership is directly mentioned, five of the comments are general statements that there should have been more involvement. "Some of the chairmen were very active in giving encouragement to participate, others remained silent, which tended to be negative." Five comments asked for

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greater direction of discussion: periodic summarizing and setting new directions; development of specific scientific questions to stimulate good input; provision for position papers. Finally, three comments directly called for the leader to take an active role in organizing and editing the information provided. Indexing and grouping, and elimination of redundancy were also mentioned.

DISCUSSION

The results of the computer conference highlight the current inability of developing-country participants to link into computerized communication systems. The concerns which must be met before more scientists are able to participate in computer communication need to be assessed. Direct funds to scientists and improved technology will be required to increase the participation among developing country scientists. Many developing country scientists work in conditions that are difficult for scientists in the industrialized countries to appreciate. They often do not have access to journals and basic equipment such as test tubes, telephones and microscopes. As described by Sardar and Rosser-Owen (1977), ". . . scientific establishments in the developing countries are fragmentary, disorganized, disunited, of limited professional competence and intellectually isolated." (p. 563). Yet, in spite of these difficulties, there is considerable agreement that a country needs its own domestic science program managed by native scientists (Sardar & Rosser-Owen, 1977). Providing funds to upgrade the communication potential of the developing countries is a possible method of giving the local scientists access to more information and more communication with other scientists, thus decreasing their isolation without corrupting their autonomy.

Participants from industrialized countries saw the potential of the technology, but have many improvements to suggest. Respondents were particularly upset by low participation, low quality comments, and a perceived lack of organization and focus. The excellent review of the computer conferencing literature by Kerr and Hiltz (1982) shows that these problems have been found in other evaluations of computer conferences.

Recommendations

The following section attempts to provide some suggested possibilities for increasing user satisfaction with the scientific content of computer conferences. The suggestions offered are oriented toward discretionary users -- those who are not required by their job to involve themselves in the discussions. Active researchers are going to participate in a computer conference only if they derive career-related benefits from it. A scientific conference should provide scientific content which is useful to its participants and recognition for contributing to the proceedings. The suggestions made here would not necessarily apply to other types of

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conferences.

Selection of a conferencing system. A reliable, easy to use system is needed. It should offer off-line editing and linkage to other conferencing systems. It does not need to have a high number of commands and special features; users do not seem to use them anyway. What is desirable in a large conference however, is automatic features to help keep the conference organized. When the participant signs in, all new information in a single topic area is presented sequentially. The participant is then asked to comment before the next topic area is presented. A system of this type should help to reduce the number of different topics that a reader needs to consider at once and perhaps even increase the focus of the discussion and the responses to items. The organization set up at the beginning of the conference is automatically maintained with little intervention from the moderator. Perhaps, if a separate stream for non-scientific communication is available, those who like these aspects of the system can communicate without distracting from the proceedings for those interested in scientific communication.

Providing technical support to users. Experienced computer users are much more likely to participate in a computer conference than novices. However, knowledge of computers is not high in the current generation of scientists unless their field is computer-related. It is not a trivial task for an inexperienced computer user to connect a terminal to a modem and contact a computer conferencing system. Thus, the more support that can be provided to help the new user develop the required skills, the better. Good documentation and a resource person who can be called for technical help are a minimum requirement. A personal demonstration of how to use the system would also help. The alternative option of providing an intermediary to use the system for the scientist would appear to be less satisfactory. In the Bioconversion Conference, those who did not use the system themselves participated less than those who personally used it.

Establishing ground rules for the conference. A number of the participants made comments which indicate that they would like the conference chairman to edit and organize the content of the proceedings. This is a good suggestion for a conference which will be judged for its scientific value and which wants to attract busy, prominent scientists to participate. On the other hand, authoritarian tactics can discourage participation, as described in a later section. Thus, any decision about the moderator's power might be an early decision of the participants--a good opportunity to use the conference's voting facility. Powers to be considered could include: moving items (in the case where topics are separated) to a more appropriate topic area; improving the keywords; deleting repetitious or inappropriate items.

Development of a realistic and useful plan for stimulating discussion. What is involved in stimulating discussion in a computer conference is not entirely clear. A number of participants suggested that experts should be recruited to lead discussions, summarize, point to new directions, answer questions, and/or submit formal material. In the Bioconversion Conference, co-chairmen were recruited with these roles in mind. However, it is not easy to get busy experts to make the time for these types of activities. They may agree to

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take on a role, but get sidelined by other activities. Perhaps a face-to-face discussion of the recruited leaders for the purpose of developing and putting introductory remarks into the conference proceedings might insure their familiarization with the conferencing system and increase their involvement.

The idea of a critical mass is often brought forth as necessary for a successful conference. The implication seems to be that a large number of bodies must be recruited in order to ensure that there are sufficient comments available to make signing onto the system worthwhile. However, if critical mass were thought of in terms of improving the density of useful material available to the participant when he signed on, thus looking for methods to improve the quality instead of the quantity of the information, more progress would be made in finding effective methods of increasing participation. The fear of missing something is probably the greatest motivator, but can only be maintained if there is something worthwhile contributed.

Providing purpose and focus. A major determinant of participation in a computer conference is the perceived importance of the conference-task to the participants. A small group working to plan a meeting or working to solve a specific problem of shared concern is much easier to manage than a more general scientific conference where the goals are less specific. Thus, a major problem for the conference leadership is to provide goals and projects which motivate participants to interact. In this conference, topic areas and topic summaries intended to stimulate discussion were provided in the opening remarks. However, discussion started slowly with many participants waiting to see if the conference was worthwhile. An approach similar to the dispersed December workshop in which groups of respondents gathered at a few major centers to provide a start to the proceedings might be a reasonably economical method to get a base of involved users actively involved early in the discussions. This would form a bridge from more conventional face-to-face contact to computer conferencing.

Providing recognition for participation. Those who are willing to provide information useful to a conference should benefit. If the conference content is generally useful to the scientific community, and if the contributions of individuals are adequately protected by copyright laws, the published proceeding will fit into this category.

It is possible that a large, formal, computer-based conference will not attract unpublished work of scientists until methods are found to increase the safeguards and prestige associated with providing information in the forum. A lack of prestige for entering information in a conference can be attributed in part to the fact that submissions are not subjected to any kind of peer review or editing to insure their accuracy. In fact, 61% of the scientists expressed a concern about the accuracy of the information. The other major problem is that the ownership of information provided in a computer-based conference is not clearly defined. Thus, scientists may fear that strangers will read their contributions and use their new ideas without proper acknowledgement. Fifty one percent of the participants in the Bioconversion Conference expressed concern about providing information in such an open conference.

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It may be that electronic mail and computer conferencing in small groups, where individuals know one another and have a relationship of trust, will prove to be one method of developing greater computer communication among scientists. Perhaps a number of scientists working on a common project in geographically dispersed areas would be an ideal group to utilize computer conferencing.

Selecting a chairman. The tasks falling upon the chairman of a scientific conference are overwhelming. Thus, the chairman should be willing and able to devote a great deal of time to his responsibilities. Arrangement of some release time from other responsibilities and clerical help would be very useful to conferences where strong leadership is required.

As noted by Kerr and Hiltz (1982), the qualities required for effective leadership in computer-mediated communication are not known, but may be considerably different from those which are effective in face-to-face meetings where gestures, tone, and facial expression accompany the message. For example, they differentiate between an authoritarian and an egalitarian approach. "An authoritarian leader's tendency to dominate the communication process is likely to decrease acceptance of the medium because of the reduced participation of others. The egalitarian leader appears to be effective in this medium. Generally, this leader encourages participation from all members, moves them to consensus, and includes all those interested in the formation of policy" (p. 81)

Summary

It is clear that funds and technical advancement are required to get the developing countries on-line in computer conferencing. Further, the level of participation and the quality of the contributions leave room for improvement in future conferences. While small, cohesive groups having a common goal may require little organization and leadership to direct their activities, this is not the case for a large scientific conference, particularly now and in the near future when the majority of scientists in many disciplines are not experienced computer users. The recommendations concerning improvements may or may not prove to be valid. However, as new approaches are attempted, a methodology for successful planning of computer-based conferences should develop.

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The Blend Electronic Journal Experiment: The Use of Computer Conferencing for Integrated Informal and Formal Communications Within a Body of Scientists

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Workshop on Computer Conferencing and Electronic Messaging
University of Guelph, Guelph, Canada
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ABSTRACT

Since 1980, the British Library Research Development Department has been funding a study into the use of electronic journals. This study has been conducted by the Universities of Birmingham and Loughborough, with Loughborough providing the expertise on computer-human factors, and Birmingham providng the software support. This talk will describe the philosophy of the study, the software support system including the use of computer conferencing facilities, and some of the results obtained so far.

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COMPUTERS AND GROUP COMMUNICATIONS: THE LAW:FORUM EXPERIMENT[1]

by

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ABSTRACT

This paper describes the implementation and results of a successful computer conference for lawyers and other social scientists. The success of such a computer conference depends on the presence of an active organizer, the adaptation of the conferencing software to meet the needs of the particular discipline, the contents of the initial discussions in the conference, and an active recruitment strategy.

INTRODUCTION

As the cost of microcomputers, terminals and modems rapidly declines so that a steadily increasing number of individuals and institutions can afford their own computers, the primary focus of creative activity is no longer on the development of new computing machinery ("hardware"). New emphasis is being placed on the creation of computer programmes ("software") that will serve a variety of social needs, and the adaptation of that software to serve the needs of particular professions or social groups.

Computers are valuable not only for their potential to serve as "stand-alone" tools for particular individuals, but for their ability to serve as a communications medium. This article will examine one of the new applications in this area, namely computer conferencing, or the use of the computer as a tool to facilite communication among groups of individuals. The utility of computer conferencing is not restricted to the sciences, but may extend to any group that needs to communicate over long distances, or where regular communication is needed on a day-to-day basis. This article will first discuss general policy issues associated with group computer communications, and then describe the interim results of an experiment to test the utility of computer conferencing for a particular nonscientific discipline, namely law.

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[1] A shorter version of this paper will appear in 111 Journal of Surveying Engineering, No. 1 (March, 1985) (a publication of the American Society of Civil Engineers).

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LIMITATIONS OF EXISTING MEDIA AS A MEANS OF GROUP COMMUNICATION

The traditional communications media are effectively polarized into two categories. At one extreme are the truly "mass" media such as television, radio, and the press. The individuals or organizations that control these media are able to communicate information and ideas to large numbers of people in a rapid and efficient manner. However, most members of the public are reduced to passive consumers of the information thus provided.

At the other extreme are two-way means of communication, such as letters or the telephone. Most people can afford to use these media to express their ideas to a single individual at a time, but they do not provide an efficient means of communication to or among large numbers of people.

What is clearly lacking under such a communications regime is a technique by which large groups of people can exchange information or express ideas in situations where face-to-face meetings are impractical.

In recent years, there has been a growing recognition that computers can also be used as a means of communications. However, researchers accustomed to traditional media have tended to think of the computer in traditional terms. Thus, until recently, computer communications systems have merely translated the "two-way" and "mass" communications models of the existing media into formats appropriate for computers.

Thus, we see proposals for "electronic" mail or "message" systems. These would permit two-way communications between individuals, similar to those provided by letters or by the telephone, through a central computer. These techniques have advantages over the use of letters for two-way communication, since they permit instantaneous transmission of information, without the long delays that reduce the usefulness of "hard copy" correspondence. Computer "messages" also compare favourably with the telephone in many respects, since sender and recipient need not be "on line" simultaneously, and the costs are considerably less than the long distance bills that would often apply to telephone conversations of equivalent length. Most of these systems do not allow individuals to communicate ideas inexpensively and effectively to sizeable groups of people on an on-going basis, however.

There are also plans for large "videotex" data-bases to which ordinary citizens could gain access by means of a remote-control device attached to an ordinary television set. "Consumer" databases of this kind supplement the scientific or professional databases such as Westlaw or Lexis which serve the needs of specialized audiences at the present time. Although the user would be able to select from a broader range of information under such a system than would be possible in the case of ordinary television, such systems still provide no effective means by which the recipient can enter information <u>into the database</u> for other readers to view and comment upon. Most members of society would still be passive consumers of information produced by others under such a system. The same limitation applies to plans to make "electronic journals" available to remote users.

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COMPUTER CONFERENCING: GROUP COMMUNICATIONS AND INDIVIDUAL PARTICIPATION

The restriction of computer communications to applications of this kind is extremely shortsighted. Computers are very flexible devices which can be adapted to serve goals that are beyond the capabilities of existing media. In particular, they can serve as an "interactive" medium, i.e. they allow communications among large groups of people, in a format that permits all members of the group to make active contributions to the discussion.

The techniques that permit group discussions of this kind have developed so recently that they are not widely known even within the computer industry. They are generally referred to as "computer conferencing" to reflect the fact that the discussions they permit more closely resemble a meeting of several people than the two-sided conversations permitted by "electronic mail" or the passive transmission of information permitted by videotex, electronic journals, and other databases.

Under the most sophisticated conferencing systems, any participant can easily enter a body of text for other members of the group to read. Thus, provision of information or expression of ideas is not restricted to the person or organization that created the conference, as in the case of television and other "mass" media. The computer will inform all other members of the conference of the entry of new bodies of text. If the participant choses to read the particular "item" of information, he or she will be given an opportunity to enter responses to the ideas contained therein. If the reader choses to make such a comment, it will be automatically displayed to others who read the original body of text.

The computer will also notify all members of the conference of any new comments that have been made on any topic since they last "signed on" to the conference. It is possible for each participant to rapidly review these new comments and make additional observations of his or her own, if this seems appropriate. As a result, there will often be a free exchange of views among large numbers of people similar to that which would take place if all the participants were present in person. A printout of a discussion in a computer conference resembles a transcript of a live meeting where a panelist's presentation is followed by general discussion. (For an example of such a discussion, see Appendix 3.)

As with live meetings, a well designed computer conferencing system will also make provision for some individual to assume the role of conference organizer. Both live and electronic meetings require careful planning and recruitment of suitable participants. It is also helpful to have someone who is clearly responsible for answering questions and resolving disputes among the members of both kinds of groups.

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SOCIAL IMPLICATIONS OF COMPUTER CONFERENCING

For a modern society to function effectively, there must be efficient means of group communications. Economic, political, and social activities now depend upon co-operation and exchange of information among large numbers of individuals.

As noted earlier, the "traditional" communications media cannot readily be adapted to situations where large numbers of people must communicate on an "interactive" basis. Accordingly, the normal means of carrying on group discussions has been to hold "face-to-face" meetings. There are a number of serious limitations to this approach, however, which have become more acute in recent years.

These difficulties are most severe for groups that draw their membership from a wide geographic base. The true costs of "live" conferences include not only basic organizational expenses and membership fees, but costs of transportation, hotel bills, and the time that participants must take off from their jobs. In a time of economic depression and rising costs, many individuals or businesses will not be able to afford to attend such meetings, and even prosperous institutions may have to restrict the frequency of attendance.

Even in the case of local organizations that do not bear economic burdens of this kind, there may still be problems in organizing on-going discussions of particular topics because of the need to gather large numbers of busy people together in a single place at one time.

Because of their polarization into "two-way" and "mass" communications, the traditional media do not provide a solution to the need for cheaper, more efficient group communications. Thus, the development of computer conferencing may help to meet a major social need. Use of a computer for on-going group communications is relatively inexpensive, since the participants need not meet in a single geographic location. Indeed, the costs of computer communications are frequently less than a long-distance call of the same length, thanks to the existence of specialized computer transmissions networks that charge a flat rate, irrespective of geographic location.

Since the computer keeps a permanent record of the observations of the participants, it is also unnecessary for the members of such a conference to be "on line" simultaneously in order to follow and participate in the discussions, which can make such a conference a convenience even for individuals who live in the same general area.

COMPUTER CONFERENCING RESEARCH: GENERAL OBJECTIVES

As noted earlier, the possibility of group communications by computer is not widely known, even within the computer industry, because of the newness of this technology. Familiarity with this medium of communication is largely restricted to a few institutions where computer conferencing systems are already in place.

It is very important that research be carried out as soon as possible to

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explore, document, and publicize the potential of computer conferencing before communications by computer become locked into the traditional "polarized" model described above. The dangers of neglecting the potential of computers as an "interactive" medium are well described in the following excerpt from a report of the Social Impacts Subcommittee of the Canadian Videotex Consultative Committee(1).

> "It is our belief that the present version of Telidon [the Canadian videotex system] is not so fully interactive as it could or should be. The newness of videotex and the fact that it is viewed on a television screen has led to the widespread notion that 'two-way television' is being introduced. ...
>
> It is technically possible, and we believe socially desirable, that Canadians shape Telidon into something like [a] more fully interactive system ... . Obviously the interactivity cannot match that achievable between individuals meeting face to face, but our concern is that current field and market trials concentrate on a system with much too limited interactivity. Present Telidon applications may 'lock us in' and preclude the possibility of future changes. A move to greater interactivity may seem some time in the future to be 'too costly' and thus Canada will have missed an opportunity to take advantage of Telidon's full potential as a <u>communications</u> system."

Because computer conferencing is an entirely new medium of communications, it is difficult to provide an exhaustive list of topics that should form the subject of a research project in this area. Indeed, one of the most important functions of research in this area should be an open-minded experimentation with the medium in order to identify new applications and new directions for research.

At the present time, it is possible to identify the following general directions for experimental research concerning computer conferencing:

1. Exploration of the potential of computer conferencing as a means of "networking", i.e. building human contacts, including:

   - improved communications within existing groups
   - organization of new groups
   - co-operation between different groups
   - multi-disciplinary communications among people in different fields
   - ongoing contacts between individuals in different regions or countries
   - communications between experts and non-experts in need of advice

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2. Examination of the potential of computer conferencing to increase productivity through improved information exchange, including:

   - eliminating duplicative activity by individuals at different locations ("reinventing the wheel")
   - stimulation of creativity through the exchange of ideas ("cross-pollination")
   - participation of a broader range of individuals in discussion and decision-making
   - computer conferencing as an educational tool (e.g. allowing direct communications between students and a variety of experts)
   - co-operation on joint projects by individuals who are separated geographically
   - availability of computer records of all discussions

3. Identification of techniques for introducing people with varying levels of computer sophistication to this technology, including:

   - publicizing the existence of the technology among the "computer literate"
   - overcoming stereotypes of the computer as a "dehumanizing" force among people unfamiliar with computers
   - creation of "demonstration" conferences

4. Identification of techniques for creating, operating, and maintaining successful conferences, including:

   - "on-going" conferences with an indefinite lifetime and general topics of discussion
   - "specialized" conferences designed to pursue narrow, short-term goals
   - techniques designed to maximize participation by group members

5. Interaction between computer conferencing and "traditional" media, including:

   - computer conferences as a source of information for newsletters and other traditional media

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- traditional media as a means of recruiting members for computer conferences

- computer conferences as a supplement to "face-to-face" conferences (day-to-day communications and planning

COMPUTER CONFERENCING RESEARCH PROPOSAL: SPECIFIC DETAILS -- LAWYERS AND COMPUTER CONFERENCING

As noted earlier, computer conferencing is a very new form of communications. The biggest obstacle to experimentation with it at the present time is the reluctance of individuals and institutions to invest in an unfamiliar technology in a time of financial constraint. If the full potential of computer technology is to be achieved it will be necessary to provide "seed money" for a number of "demonstration" conferences which would allow new users to experiment freely with computers as a means of group communications, without immediate financial concerns. Accordingly, a two-year grant was obtained from the John and Mary R. Markle Foundation of New York, to permit experimentation with computer conferencing on a subsidized basis. Most of the funding under this grant was designed to provide financial support would be provided for participation by conference members in a variety of computer conferences. This would permit potential users to fully experience the benefits of this new communications medium before they have to decide whether they wish to assume its costs. One of the goals of the research project would be to identify means by which conferences can be made self-sustaining.

As with all successful groups, the members of a computer conference must have some common interest. Similarly, a research proposal in this area must have some coherent focus, if systematic work is to be done. The most logical approach is to focus upon the integration of computer conferencing into a substantive discipline where it has not previously been utilized. Accordingly, the general research objectives described above have been pursued through an examination of the interaction between computer conferencing, members of the legal profession, and other sectors of society.

There are a number of reasons why lawyers make a good subject population for a study of computer conferencing. First, lawyers play an important part in the interaction between communications technology and society through their role as legislative and administrative regulators. They are more likely to make intelligent decisions if they have some first hand experience with the technology in question. Thus, it is important that a reasonable number of lawyers be aware of the potential of computers as a means of group communications.

Second, the profession contains both a small, widely scattered group of lawyers who have some familiarity with other computer applications, and a much larger number of lawyers who little or no experience with computers. Thus, there are opportunities to experiment with the introduction of computer conferencing among both "computer literate" and "non-literate" individuals.

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Finally, the broad range of areas in which lawyers are active makes law a natural choice for a range of "demonstration" conferences. It is important that the topics under discussion in such conferences should be of interest and intelligible to individuals from other disciplines who might be interested in adapting this medium of communications to their own uses.

Law and lawyers play a role in virtually all human activities, from family disputes through criminal justice to the development of technology. The breadth of lawyers' interests is demonstrated by the presence of courses in "Law and Psychiatry", "Law and Technology", "Law and the Media", etc. in law school calendars. Thus, law is a natural choice for an experiment in computer conferencing if the intent is to encourage multi-disciplinary discussion. Similarly, many of the problems of interest to lawyers extend across international boundaries, so that long-distance group discussion of these issues among people in different jurisdictions will frequently be of value.

The initial step in this research project was the creation of a "demonstration" conference for the discussion of issues relating to "Law and Computers", and known as Law:Forum. There were a number of advantages to the creation of an initial conference with this focus. First, lawyers who are already "computer-literate" are more likely to be open-minded concerning the merits of unfamiliar computer communications technology than lawyers who have no experience with computers whatsoever. Thus, would be easier to induce widespread participation in such a conference than it would be if we were working with complete neophytes. This conference would also provide a means of experimenting with techniques for effective management of conferences composed of busy lawyers, preferably with feedback from the members of the conference to help in the identification of the best techniques.

Once a successful conference had been established by these means, it could then be used to demonstrate the merits of electronic group discussion of legal issues to lawyers with little or no previous computer experience. Such lawyers could be encouraged to participate for a time in the existing conference, in order to see if this technology is capable of meeting their needs in other substantive areas.

Second, there is an urgent need to establish some effective means of group communications among lawyers working with computers. Indeed, the "Law and Computers" field provides a classic example of the need for a new medium that would permit isolated individuals working in new and rapidly developing areas to identify common interests.

The integration of computers and law is very new. Thus, lawyers who are computer experts are widely scattered geographically and situated amid large numbers of other lawyers without computer expertise. This problem is exacerbated by the lack of effective communications channels between legal academics working in this area and members of the practicing bar with similar interests. Thus, in the absence of a computer conference there is a real danger that researchers and litigants in various regions will waste time and energy in "reinventing the wheel".

Moreover, there is a tendency for those lawyers who do have an interest in computers to focus upon narrow specialties. Examples include analysis of the substantive law concerning computers, development of legal data bases, creation of computer "tutorials" to assist in legal education, and "artificial

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intelligence" research designed to create expert systems for lawyers. In the absence of a common medium of communications, this "specialist isolation" is likely to result in the loss of opportunities for fruitful "cross-pollination" between lawyers working on different projects.

Third, although the majority of lawyers remain unfamiliar with computers, there is a growing interest in the field. Thus a "Law and Computers" conference could be a valuable educational tool, both for law students and for members of the bar, since it would permit them to discuss issues that interest them on an interactive basis with existing experts in the area.

Fourth, such a conference would provide a valuable opportunity to explore the potential of computer conferencing as a medium of interdisciplinary and international communication.

On the interdisciplinary level, many computer scientists have a strong interest in legal problems affecting their field, and would be eager to participate in such a conference. Indeed, legal issues, such as the prevention of software "piracy" have sometimes been topics of discussion in existing computer conferences composed primarily of programmers.

On the international level, it would be very beneficial for Canadian lawyers to have on-going contacts with their American counterparts, since the development of legal applications for computers in Canada has lagged behind that in the United States.

Finally, a conference of this sort would allow experimentation with the interface between group communications by computer and other media. For example, in addition to my research on computer conferencing, I am also editor of the newsletter of the proposed "Law and Computers" Section of the Association of American Law Schools. This newsletter provided one means of identifying potential conference participants. The newsletter's communications capabilities are limited, however, by the fact that the Section does not include members of the practicing bar with computer expertise. A computer conference on law and computers could obviously provide a source of information <u>for</u> the newsletter, and permit the dissemination of its contents to a wider audience.

Once this "demonstration" conference was successfully established, the scope of the project could be broadened through the establishment of computer conferences intended for lawyers outside the law and computers field. These later conferences could draw on the lessons learned from the demonstration conference, which would also assist in the identification of lawyers in a variety of substantive fields who were willing to experiment with this new medium. Possible topics identified at the time of the original grant proposal included on-going conferences on issues of comparative law, short-term conferences to provide continuing legal education on specific topics for lawyers scattered throughout a particular jurisdiction, additional multi-disciplinary conferences (e.g. Law and Medicine) or the establishment of conferences designed to provide legal information for lay people.

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SELECTION OF A CONFERENCING SYSTEM

The research programme described above has been carried out using the "CONFER" conferencing system developed by Dr. Robert Parnes. Discussions with individuals with experience with a variety of systems had confirmed that CONFER is the "state of the art". It is very easy for individuals without computer experience to learn to use this system. (For discussion of CONFER and a variety of other computer conferencing systems, as well as the general potential of computer conferencing, see the general bibiliography contained in Appendix 2.)

CONFER is available only on university computers using the "MTS" (Michigan Terminal System) operating system at the present time. Institutions using this system include Wayne State University in Detroit, the University of Michigan, and Rensselaer Polytechnic Institute in the United States, and University of Alberta, University of British Columbia, and Simon Fraser University in Canada. The research described in this study was carried out on the Wayne State University computer under the sponsorship of the Wayne State Law School. My own university (Dalhousie) does not have any computer conferencing facilities of its own. Efforts are being made to encourage the acquisition of such a system.

DEVELOPMENT OF A "LAW AND COMPUTERS" DISCUSSION GROUP: LAW:FORUM

As noted above, the first stage of the research project was to be the creation of a "demonstration" computer conference designed to explore the interaction between law and computers. To help plan this conference I recruited a small advisory group composed of lawyers with prior experience with the use of computers as communications tools and a number of computer scientists and individuals from other disciplines with an interest in this project. Since the advisory group was scattered across North America (Halifax, Toronto, Washington D.C., Ann Arbor, Detroit, East Lansing), discussions took place through a small computer conference, Law:Startup.

The first step was the customization of the CONFER software and documentation to serve the needs of lawyers and others who are new to computer communication. Law:Forum was set up in a manner designed to minimize contact between its users and the general operating system of the Wayne State computer in order to reduce the amount of technical jargon and commands that new users would have to master. For example, when a Law:Forum participant signs on he or she is automatically put into Law:Forum without the need to issue specific commands to the operating system or the CONFER software. The detailed CONFER documentation was compressed to cover only essential commands, in view of the probable reluctance of busy lawyers to read large documents. It was supplemented by additional material to explain the basics of computer communications to neophytes (e.g. modems, communications software for micros, computer communications networks such as Telenet and Datapac).

Members of the Law:Startup group were encouraged to contribute items and responses to Law:Forum before it was opened to the general public. New users would require time to experiment with the CONFER software before they would be in a position to contribute actively to the conference. It seemed likely that they would be more willing to take the trouble to master the system if active

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discussions of interesting topics were already taking place when they first joined the conference.

The next step was to notify potential participants of Law:Forum's existence and invite their participation. A number of different forms of "outreach" were used to accomplish this goal. These included speeches to groups interested in the law and computers field (e.g. appropriate sections of the Association of American Law Schools, the Canadian Association of Law Teachers, and the American Bar Association) and hundreds of letters of invitation to individuals who had demonstrated an interest in the relationship between law and computers in other contexts. As Law:Forum grew an increasing proportion of recruitment took place through informal "networking", i.e. conference members suggested the names of friends or associates who might be interested in participating.

Law:Forum was established on September 28, 1983. By September 18, 1984, the conference had 381 registered participants and 265 discussion topics ("items"), with a total of 7744 comments ("responses") on all these topics. A full transcript of the conference occupies two large ringbinders. The subjects discussed include computer applications in law (e.g. artificial intelligence, computer aided instruction, legal research and retrieval systems, support systems for law schools and law offices), social consequences of computerization (e.g. impact on privacy, legal employment, computer crime), and substantive law governing computers (e.g. software protection, computer contracts, consumer protection in the computer field, transborder data flow, antitrust and tax law relating to computers, etc.).

The participant statistics in the previous paragraph may be somewhat misleading. The building of sufficient "critical mass" for successful computer conference discussions proceeds through a process of elimination. Only a small proportion of individuals notified of a conference's existence through "outreach" activities will actually contact the organizer to request participant status. Only part of those provided with the necessary information will actually sign on. Of those who do join the conference, some will continue to participate on an on-going basis, while others will drop out permanently or temporarily because the conference does not meet their needs or because of the pressures of other activities. This latter problem is likely to be particularly acute for busy professionals. Of those who do participate with some regularity, some will contribute actively to the conference through items or responses ("talkers"), while others prefer to remain silent and concentrate on reading the contributions of others ("readers).

One measure of active participation is the time that has elapsed since a registered participant last signed on. Statistics of this kind were gathered for Law:Forum at 11.45 p.m. on September 18, 1984. At that time, 56 people (14.5% of all registered participants) had signed on within 24 hours, and 71 individuals (18.6%) had signed on within 48 hours. Over the course of one week 113 members (29.7%) had participated, while 131 people (34.3%) had signed on within two weeks. The corresponding figures for a one month period were 152 individuals signed on (39.9%) while the cumulative participation rate for two months was 196 people (51.4%). These statistics may underestimate the active participation level, since they overlap the summer vacation period and the start of classes when many conference members may be distracted by other activities.

It is harder to provide an accurate measure of the proportion of active conference participants who are "talkers", i.e. people who actively contribute

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items and responses as opposed to "readers" who merely observe the discussions of others. A precise estimate would require an exact count of the number of responses per participant, which is not possible at the present time because of the large number of responses (more than seven thousand). A quick scan of the conference transcript suggests that about a quarter of the registered participants have contributed at least occasionally to the conference discussions. Roughly three fifths of individuals who had signed on within 24 hours on September 18, 1984 were "talkers". The proportion of participants who were "talkers" declined to less than half of those who had signed on within one week and to about a third of those who had signed on within two months. This suggests that "talkers" are more likely to remain involved in computer conferencing on an on-going basis, and sign on more regularly than "readers".

Another measure of conference activity is the number of responses per item. Information on this point was gathered for Law:Forum on September 19, 1984, when there were 266 items and 7822 responses. The average number of responses per item was 29. However, there was considerable variation in the number of responses per item. Only 8 items had attracted no comments. Seventy items had 1-10 responses. Eighty-nine topics had 11-30 comments. Forty-one discussions had 31-50 comments. Forty-six opics had 51-100 responses. Finally, ten items had more than 100 comments recorded.

The 381 participants registered on September 18 were drawn from all over Canada (8 provinces) and the United States (31 states and the District of Columbia). There were 64 Canadian registered participants (16.8%), 310 Americans (81.4%), and 7 people whose origin was uncertain. The jurisdictions with the largest representation were Michigan (135) California (24), Illinois (21), Nova Scotia (18), Alberta and Ontario (15 each), the District of Columbia (13), New York (12), Minnesota (11), New Jersey and Massachussetts (10 each), Missouri (9), Ohio (8), British Columbia (7), Texas (6), and Washington, Iowa, and Colorado (5 each). It is easier to specify the jurisdictions that were unrepresented than to list all the states and provinces from which participants were recruited. In Canada, all provinces were represented other than Prince Edward Island and Quebec. All continental American states had participants except Connecticut, Delaware, Kentucky, Louisana, Maine, Mississippi, Nevada, New Hampshire, North Carolina, North Dakota, Rhode Island, South Dakota, Vermont, West Virginia, Wisconsin, and Wyoming.

The participants also had diverse backgrounds. Of the 381 registered participants on September 18, 1984, 75 (19.7%) were practicing attorneys, 60 (15.7%) were law professors or other legal educators, 29 (7.6%) were law librarians or provided other legal research services, 79 (20.7%) were law students, 60 (15.7%) were computer scientists or other computer specialists, 30 were other educators or social scientists, 8 (2.1%) were legal civil servants, 16 belonged to miscellaneous occupations (4.2%, including 8 legal civil servants, 4 American Bar Association staff, 2 judges, 1 state senator, and a member of the Wayne State police force), with the background of 32 people (8.4%) remaining uncertain. The backgrounds of the 56 highly active participants who had signed on within 24 hours on September 18 were also diverse: 12 attorneys (21.4%), 13 legal educators (23.2%), 6 law librarians/legal research services (10.7%), 10 law students (17.8%), 6 computer experts (10.7%), 3 other educators/social sciences (5.6%), 3 miscellaneous (5.6%: 2 legal civil servants, 1 ABA staff member), and 3 unknown (5.6%).

Some perspective on Law:Forum may be obtained by comparing this conference to

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other conferences under the CONFER system that are present at Wayne State and University of Michigan. Law:Forum began on Sept. 28, 1983. On September 23, 1984, it had 388 registered participants, 266 items and 7923 responses. WCSC:Forum, the general purpose computer conference for the Wayne State computer community began on January 5, 1983 (i.e. more than 8 months before Law:Forum) and has 376 participants, 213 items, and 4503 responses. User:Forum, the University of Michigan "general" computer conference, began on Aug. 25, 1983 (one month before Law:Forum) and has 283 participants, 256 items, and 4721 responses. Thus, Law:Forum is larger and more active than the general computer conferences used by the Wayne State and University of Michigan computer communities, despite the fact that it began after they did. The largest computer conference at these two universities that began about the same time as Law:Forum is CRLT:Micros5 at the University of Michigan, which is devoted to the discussion of topics associated with microcomputers. Crlt:Micros5 began on September 14, 1983, has 745 participants, 953 items, and 12846 responses, and is much larger than Law:Forum or any of the other computer conferences at these universities. However, the average number of responses per participant is higher in Law:Forum (20.3 responses per participant) than in Crlt:Micros5 (17.2 per participant).

The goal of the Law:Forum experiment was to see whether it was possible to create a viable computer conference composed primarily of non-scientific professionals (lawyers) that achieved a respectable level of discussion and activity and that was multi-disciplinary and multi-national in scope. From the evidence described above, it appears that these objectives have been achieved, and that members of non-scientific disciplines can make effective use of computer conferencing to discuss areas of mutual interest.

NEW COMPUTER CONFERENCES IN SPECIALIZED AREAS

Law:Forum also proved to be a fruitful source of both ideas for new legal computer conferences and volunteers to serve as organizers for those conferences. This latter fact is important since a person active within a particular substantive area is more likely to identify potential recruits for a specialized conference in that field than a general researcher. Moreover, the organizer's role is time-consuming. In addition to such "start-up" activities as creation of initial items and recruitment of participants, he or she must answer a steady stream of private inquiries from individual participants (two-way electronic mail). For example, I generally have to spent half to three quarters of an hour answering messages before I am free to read the group discussions in Law:Forum.

Activity in most of the second-generation conferences under the Markle grant is too recent to permit an empirical evaluation of the sort described above. Accordingly, they will be described in general terms.

The first specialized conference established was Law:Caned, a discussion group for an executive committee of Canadian Law Professors who had been authorized at a live meeting to formulate recommendations concerning the structure and funding of an on-going organization for Computer-Aided Legal Instruction in Canada. The group will probably be organizing a "live" meeting to which the resulting recommendations can be submitted some time during the coming year. I served as organizer for this group, as well as for Law:Forum.

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Law:AI was originally called AR27:AIclass and organized by a Wayne State computer science professor for his class on artificial intelligence. A group of lawyers from Law:Forum with an interest in this field joined the conference and gradually came to dominate discussions as the end of the academic year approached. In order to permit the discussions to continue after the termination of the original class, the conference was adopted as part of the legal computer conference project, with Professor Marvin Green of Chicago Kent Law School serving as organizer. The activity level in this conference has been uneven, but it has provoked some interesting experiments. For example, one of the prerequisites for designing an expert legal system in a particular substantive area is capturing the steps that the expert goes through in resolving a problem. The Law:AI participants have used Confer's item/response structures to try and capture the steps involved in the resolution of sample real estate and family law problems.

Kristy Elam of the St. Louis University Law Library suggested the creation of Law:Library, a conference for librarians interested in a variety of computer applications. This conference is open to librarians from disciplines other than law. Ms. Elam is doing the organization and recruitment for this conference. Law:Library is the most consistently active of all the conferences after Law:Forum itself.

Law:Contracts is a conference for the discussion of all aspects of the contracting process and the substantive law of contracts that are of interest to the participants. The initial focus is upon contract issues relating to new technology, but participants may discuss contracts in other fields that interest them. The organizer is Jim O'Connor, Senior Corporate Counsel for Mutual of Omaha. The results of this conference will be particularly interesting, since many lawyers working for computer companies do not have first-hand experience with the use of computers in their own work.

Law:Labour is organized by Professor Kit Rigg of the University of Calgary Law School. The conference's purpose is to permit people interested in labor law or the impact of computers and other new technologies on labor law to discuss matters of common interest.

Carol Priestaf, a University of Michigan Law Student, has been active in triggering a number of conferences for University of Michigan students. The first was Law:Summer, a conference for "summer starters", i.e. first year law students who take their first classes in the summer before the start of the regular term. It was hoped that this conference would encourage discussion between students and professors, but in practice most of the discussion was among the students and dealt with social topics. However, this experiment attracted the attention of two University of Michigan professors who will be experimenting with CONFER as a supplement to classes this fall, with the aid of Ms. Priestaf. These conferences were to be called Law:Courts and Law:Health. Unfortunately, Law:Health never got off the ground, and Law:Courts displayed limited activity, despite a great deal of work by Ms. Priestaf and independent participation by the professor in law:forum. Conferences designed primarily for law students seem to be the least successful of all the experiments under are project. This may reflect the fact that the participants in all the other conferences are self-selected, while class-related computer conferences are thrust upon arbitrary groups of law students who may have no need for and no interest in this mechanism, since they can communicate regularly with their

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classmates and professors by ordinary means. By contrast, a number of individual students have found the various conferences to be of interest, and have participated in them on an ongoing basis. Quaere whether there would be different results in law school environments where all law students use computers regularly as part of their legal research and writing.

The final conference that is being planned at the present time is Law:CLE, which will be used for an experiment in continuing legal education. This conference will be planned and supervised by Joel Gilman of the Washington Bar and Leigh Webber, the Assistant Executive Director of the Continuing Legal Education Society of British Columbia.

Other proposals for new computer conferences may be brought forward during the remaining nine months of the research project. Suggestions for such experiments from readers of this article would be welcome, and should be submitted to Professor Jennifer K. Bankier, Dalhousie Law School, Halifax, Nova Scotia, B3H 4H9 (902-424-3344).

The final stage of the research will be observation of the results as the subsidy from the Markle foundation is gradually withdrawn. At this stage participants will be obliged to directly weigh the benefits of computer conferencing against its costs. Members of Law:Forum have expressed a desire to keep the conference alive, and we will be discussing alternative means of funding, e.g. individuals paying for their own accounts, subsidies from other sources, tax deductibility of conferencing expenses, establishment of a non-profit corporation, etc.

CONCLUSION

The interim results of the Markle research project on computer conferencing suggest that computerized group communications software can be adopted to serve the needs of professionals in non-scientific disciplines if sufficient thought is applied to the structure and initial contents of the computer conferences in question, and wide-ranging recruitment strategies are applied to obtain an adequate number of interested participants. If lawyers can make successful use of this medium despite their limited exposure to computers in the past, it seems likely that engineers, accountants, and lay people from a wide variety of backgrounds would find this technology helpful in overcoming the problems created by high travel costs, declining budgets and "telephone tag" exchanges of unsuccessful phone calls among busy people.

APPENDIX 1.--REFERENCES

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APPENDIX 3: SAMPLE ITEM FROM LAW:FORUM

Item 91 09:18 Feb16/84 19 lines 68 responses
Gerald Bennett
COMPUTERIZED LAND TITLES

One of the most convoluted mechanisms in law is the current title search methodology. By the time the participants in a property transaction have completed the search and purchased title insurance--in case the search was erroneous and which, in most cases, is absolutely unnecessary except for the concern engendered by our intricate and arcaic system, the cost is significant. The system we have evolved has, I concede, established two industries - that of the closing attorney and that of the abstracter-title company.

In the days of computers, such a system, I submit, is unnecessary. I am not suggesting that we use computers for a title search; I am suggesting that we eliminate the need for title searches by computerizing title information in much the same fashion that we issue automobile title certificates.

Therefore, I propose the following topic: IS COMPUTERIZED RECORDATION OF TITLES POSSIBLE? IS IT DESIRABLE? WHAT KINDS OF DATA WOULD THE RECORDATION PROGRAM HAVE TO INCLUDE? In other words if we were writing such a program, how could it function?

68 responses

1) Gerald Bennett: In this state, at least, the property taxing authorities have developed a numeric system for designating each parcel of property in the area, and tax each separately. This could be used almost immediately for a means of designating the property involved, without having to refer to sections, townships or even lots or plats. One could require that any mortgage or other lien specifically put on the property require such a number at the time of recordation.

I have greater difficulty, however, with judgments. Unless one develops some individual identification number (a concept which I abhor-- Social Security numbers are used for too much already- it seems a difficult task to affix judgments to the certificate. Similarity of names would seem to make judgment recordation by name difficult at best. Is this an insurmountable problem?

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2) David Sherman: The main step in improving land title searching is to move from the registry system (all documents re the land in a file) to the Torrens system (govt. gives you a certificate saying the land is owned by X). Once that's done, computerization isn't all that I suspect. Until that's done, computerization isn't the best route -- changing the system is.

In Ontario, we have both systems, but there's a gradual (very gradual) changeover, since all new subdivision must be under the Land Titles (i.e., Torrens) system.

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3) Brian Howard: People, like automobiles are mobile, land is not. What are the advantages of the Torrens system -vs- the current registry system. Seems to me that the current 'archaic' system is a good (solvable) problem in topology.

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4) Gerald Bennett: Under the Torrens system, how are judgment liens against the property handled? Are they affixed to the certificate after any judgment is

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rendered? In our system, of course, one has to search the judgment rolls as well as the real property records in order to ascertain whether any civil judgment has attached. Do all judgments have to be separately recorded under the Torrens system? It occurs to me, little though I know of that system, that it would lend itself beautifully to computerization.

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5) David Warner: My property expertise is long in the background, but It seems I recall that the Torrens system originated in Australia, was imported to Canada and England and from Canada found its way down to the U.S. While it would seem very well suited for computerization, and probably really as Dave Sherman suggests, eliminate the need for such, It has not met with widespread enthusiasm (sp??) down here. It is in effect in a number of jurisdictions, at least as an optional system -- Minnesota ?? - and was adopted and then repealed in a number of others, Nebraska being the only one among them that I can remember. I would imagine the dissatisfaction was a result of some of the same concerns which Gerald expresses in response #4.

There is a series of articles, really conference reports, that touch on the automation of land title searching in 10 Real Property Probate and Trust Journal at 593 (1975). I had the reference in some old notes and I do not know recall why I had it or where it came from. I just looked at the articles and they are rather scant, but might be a point of beginning for those who want to pursue it.

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6) David Sherman: In the Ontario Torrens system, you still have to do a separate searhc for a few things. But the basic work of figuring out title to the land as of a particular date is done ONCE, and thence guaranteed. Under the registry system, the same work is done over and over every time the land is sold.

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7) Gerald Bennett: specifically, David, what are the kinds of things that still require a separate search? If we have computer capability, shouldn't we be able to eliminate any kind of search, any kind of uncertainty by reflecting everything on the title?

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8) David Sherman: I don't know enough about title searching to answer that. I believe there are things relating to sheriffs, executions and the like. Also, various utilities and government bodies have to be contacted to make sure they don't have unregistered (but valid) liens, rights and so on.

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9) Kevin Quiggle: It seems that in order to obtain the maximum benefits from computerization of titles you would need to tie all interested parties into one system, so that any liens, etc. would automatically be registered with the titles data base. This does not seem like an insurmountable problem, except that you might step on a lot of toes as various bureaucrats defend their turf.

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10) Leigh Webber: Several years ago, a group of three Maritime provinces (N.B., P.E.I. and N.S.) embarked on an ambitious project to computerize the land system. The idea was to build a series of monuments whose positions were fixed using extremely accurate electronic surveying techniques. The monuments' positions were described in terms of a gigantic cartesian coordinate system. After the monuments were erected (this was done a few years back), the next phase was to take every parcel of land in the region and define its boundaries in terms of the cartesian coordinates of its vertices. The final stage was to be the creation of a computer system permitting searches of any square centimetre of dirt simply by typing in its coordinates.

This has to be the final word in land searching --- just look at a map, pick off

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the coordinates, punch them in, and --- hey presto! --- a state of title certificate pops out.

It seems to me that the only problem with judgments is finding out what land is owned by the debtor. With a computer system of *any* decent type (Torrens, registry, or the super-system described earlier), one ought to be able to type in the debtors name (in root form or in detail) and see a list of properties along with further descriptions of the owners (to make sure you have the right victim). In B.C. it used to be that you would "register" a judgment simply by recording it in a judgment book.

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11) Leigh Webber: A few years ago they changed the system to require creditors to register against specific titles. That's probably fairer --- the creditor stands to gain something, so let her do the work rather than the BFP (bona fide purchaser) who otherwise must search tomes of judgments nervously half expecting to find 158 "Frank Smith" judgments "in the air".

Jennifer, do you know anyone who can update us conferees on the LRIS project?

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12) Jim Sprowl: In Chicago, we have both record-of-title and Torrens. The ownership and all liens against Torrens property must be recorded on the title certificate, three copies of which exhist -- one held by the state, one by the owner, and one by the mortgagee. All must be turned in at the closing, along with a report of a judgment search, to the torrens officer who then issues a new title to the new owner. The titrle is guaranteed by the State torrens fund, which is a form of title insurance. Closings typically begin with a three-hour wait, which is costly of attorney time. Record-of-title searches in Illinois are typically handled with title insurance -- slightly more expensive, but no three-hour wait at the Torrens office, and at least as good a guarantee.

I personally think the title companies and the government torrens opffices should computerize to lower the cost and speed the process of title clearing.

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13) Jim Omura: The main thing that has to be searched separately under the Ontario Torrens system is Executions out of court. This isn't theoretically that bad as there are generally provisions for rapid searching of these executions in the registry offices anyway. They must be double filed in the first place (once with the Sheriff and also once under the Land Titles Act--the latter being the relevant registration for the Torrens land parcels). Other relevant searches are for adjacent land owners, taxes etc.

As good as the Torrens search seems in theory, I have *always* had to search back the standard 40 years and trace the route just as if the land is registered in the old system. This is I suppose over cautiousness on the part of the Ontario Practice, but the only thing that the act can guarantee really is damages in compensation if they make a mistake. As we all know, in regard to real estate, money is rarely considered a good form of compensation. June 10/84

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14) Peter Junger: In the States there are two problems with the Torens system. One is Constitutional. To put land into the system you in effect have to bring a quiet title action against the whole world, and even then the Due Process clause has the effect of making the Torrens title ineffective against someone who should have been served but wasn't. The other problem is that the guarantee funds are under capitalized. The one in Los Angeles went bust in the thirties and I don't think it could pay as much as a cent on the dollar. The system is

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also disliked by some because it makes it too easy for an unscrupulous agent to destroy the owner's title, those who own land tend to think that caveat emptor is a good idea.

Another problem is that Torrens titles are so rare most places. In the middle sixties there were five Torrnes titles in all of Duchess County New York. And until a client of ours purchased title No. 3, no clerk alive had ever made an entry in the Torrens book. Our client was giving the land--it was the top of a mountain where I doubt any surveyor had ever been--to a body with the power of eminent domain. I don't think anyone would have dared purchase it otherwise. It was just too wierd to be marketable. And we ran title through the regular recording system as well. And got title insurance. Of course, for the tops of mountains it has its advantages, the statutes usually prevent the land's loss by adverse possession.

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13) Gerald Bennett: The Constitutional Due Process prohibition would not fly if the state were to pass curative acts that gave sufficient notice and opportunity to establish rights. If a person has not in any way enforced a right in land for an appropriate time, laches would not be an inappropriate doctrine to prohibit that enforcement in the future. In other words, I think there are many ways to cure that problem. I further believe the real objection to be economic turf protection... the abstract companies, title insurance companies and members of the bar specializing in property form an effective lobby as against the occasional home buyer...who may gripe when purchasing the home but then forgets the objection when the closing is behind him/her.

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14) Peter Junger: You may be right in the turf protection argument. But that is all the more reason to fear the Due Process argument. It is normally state Due Process clauses which you have to worry about. Curative acts of the type you suggest did not work in New York State to get rid of old powers of termination and possibilities of reverter. And the cost of putting land into a registration system, even if it could work, will not seem worth in to many owners. There are a fair number of potatoe fields in the middle of Long Island which have been torrenized but that was because there was a cloud on their title caused by old subdivision declarations. Nobody could figure out how to get rid of the declarations. As far as I know the registration wasn't of much help in solving the problem.

I believe that in some parts of New Jersey if land is Torrenized it is ipso facto unmarketable. That may be the result of turf protection. The mere fact of turf protection is a strong argument for a land owner to avoid registration. You can't expect him to risk his investment for the public good. I think that there are lots of potential problems with present land titles and I do not think that one can cure those problems by passing legislation that they don't exist. If we were starting fresh Torrens might make sense, but for a region with some history I suspect it's too much trouble.

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17) Gerald Bennett: I really disagree. A landowner would have no choice to "Torrenize" or not if that became the only way to convey. If the system were begun today, and each property transfer were placed in the certificate system, it would be no undue burden on anyone. The process would occur over a period of years, but would occur gradually. I agree that the rights of persons would have to be carefully protected, even those not in possession, but I don't think it impossible to initiate the system. It is not economically feasible, however, when the only organized groups with economic interest are those which have the

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interest in maintaining a convoluted and lucrative system.

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18) Jim Omura: It has just occurred to me that we are assuming that conveyancing and transfer of property are very similar in all our jurisdictions. I for one have never had the *pleasure* of searching any property outside the Province of Ontario. Would anyone like to provide us with some details as to the mechanics, logic and pitfalls of their local systems?

In the non-Torrens system we have to search back to an acceptable "root" of title within 40 years. Generally, most searchers will go back slightly farther than 40 years to be on the safe side.

Usually, I find a Lot and Plan number from the Tax roll (which is kept at the City Hall for the Toronto region).

I then pull the Volume in the Registry office and double check that I'm on the right property. Then I buy copies of the Plan (sometimes more than one survey Plan is necessary).

I then list all relevant documents relating to my property (usually about two documents on a horizontal 8 1/2 * 14 in. paper). The following is a typical list of information for one document, however, the information is listed horizontally on a page rather than vertically as I'll show here:

Instrument No.	CT123456
Type	Grant
Dated	30/05/84
From	John Jacobs and Mary Jacobs, as JT
To	Larry Wilson and Martha Wilson as JT

- - - - -

19) Jim Omura:

Consideration	$2.00 etc.
	Com'g NW corner of Lot 15, run'g S along W side Lot, then run'g E 30 m. // to N side of Lot 14, then N along Baker St. to N side of Lot 15 (30 m.) and then W 30 m. along N side of Lot 15 to beginning.

(sorry for the error on the east side

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20) Gerald Bennett: Jim: in our area, and many in the states, I suppose, most of the record searching is already done by the Title and Abstract companies. They have their records already sorted as to parcel, and as new records are filed, they simply add them to the existing records regarding a particular parcel of land. We order an "abstract" of title, and receive a modestly voluminous book, one which takes the title back to the grant from the Government of Spain to Don Arredondo, and trace the title from there. Actually, the title standards do give us a more limited period (40 years sounds about right) where the search is necessary. These companies will offer "title insurance" on the various parcels

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that they have listed. Actually, if we were to computerize, we could require that each transaction result in a policy of title insurance to insure the initial certificate of ownership...it might work....?

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21) Jim Omura: Due to a keyboard error (do I hear chuckling erupting across the continent? I was unable to finish my description of a typical search. Generally, I pull all the original documents and make sure each conveyance on my land was proper in regard to all applicable laws, make a sketch of the property identifying its boundaries and attributes as well as identifying adjacent lands, and do similar searches of all adjacent lands with an eye to conflict of boundary claims or claims to right of way or easements, and also mutual ownership of adjacent lots which might result in merger problems (our Planning Act bars subdivision of property in certain circumstances).

I also search outstanding executions in the Sheriff's office and unpaid Municipal taxes and utilities which may form enregistered liens on title.

If I give the search to a conveyancer to do for me they do all the same work fresh. As far as I know, nobody bothers to stock-pile the searches in Canada as you describe.

We seem to be substantially different, even aside from our Torrens system.

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22) Larry Eisenberg: In the West, I doubt that there is more than a handful of attorneys who could do an effective title search (at least who are not employed by a title company). The Torrens Act did not work in California and for those properties which were listed, the nightmare continues to this very date. Seems to me that there were some problems, also, dealing with subdivisions and lot splits which drove Torrens crazy. Say -- this was an interesting item, wonder why there aren't any more entries?

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23) Jim Sprowl: In Illinois, the Torrens system is alive and quite healthy. The state insurance fund has a large positive balance. I have transferred property both in and out of Torrens. Conceptually the Torrens process is simpler and less expensive, but one faces a long wait of several hours at the Torrens office before compleating a closing. Non-torrens proberty is normally insured, and the Insurance companys do all the necessary searching in a tradition dating back to the great Chicago fire. I think it is primarily new subdivisions that go into Torrens because it is cheaper than title insurance for the developer.

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24) Gerald Bennett: A large part of the problem may have been an attempt to "torrenize" under the concepts of land descriptions rather than numerical sorting. Our tax assessors have no difficulty computerising individual pieces of property when then are (they, not then) are subdivided, and they easily keep track of the various convolutions. The problem of unregistered liens could be easily solved-- the agency MUST list them in the computer. That way, the onus is placed on the agency establishing the lien (obviously opposition by IRS is forthcoming) rather than on the searcher to uncover every possible lien; Ditto for judgement liens. It becomes the obligation of the one establishing the lien to have it entered. So far, I have seen no specific problem that could not be overcome if the desire to do so were present. What problems, other than lethargy, prohibit such a system from being made operative?

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25) Peter Junger: Here are some cases I have worked on where I wonder what a Torrens system would work. I'm not suggesting our present system worked well.

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First case: a surveyor made a mistake back in the 1760's, sighted on the wrong church steeple. The result was that the portion of the great barrier reef (aka Fire Island) shown on his survey was about a third again as large as it was in actuality. Later this land was subdivided. Some of the lots shown on the survey of the subdivision simply did not exist. Several people bought some of the non-existent lots in the 20's and got title insurance. The title insurance company went bust. When the Fire Island National Sea Shore was created, it turned out that those lots didn't exist. To show that one had to trace title back to the original grant before the revolution.

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26) Peter Junger: Second case: A small plant was built on several parcels which had been assembled by a former owner. The parcels had a "strip or gore" in the middle which existed physically, but didn't appear on the land records. It was under the main building. We were going to make a mortgage loan secured by this land. Result: title company agreed, without additional charge, to insure our lien. They would not insure the fee owner, but suggested that the land be conveyed to a straw and then reconveyed using a description which included the strip or gore. They said that after 10 years of peaceful possession they would insure the fee.

That's enough war stories for the moment. I'll give some more latter on.

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27) Peter Junger: Here's another example, one where I do not think that I would be very happy with a Torrens system. We had a client who bought a summer home and got title insurance on it. It was financed by a purchase money mortgage from the seller. That mortgage was listed as an exception on our policy, but we were insured against any other mortgage liens. It turned out that the seller was a bit of a crook. He had given a mortgage on the premises to secure a debt of his. He did that about 10 days before he sold the land to our client. The lawyer for the debtor made a mistake in getting the mortgage in recordable form (I think the lawyer was the debtor) and returned it to our seller for re-execution. Of course, he didn't reexecute it, he sold the land to our client and went to Florida. Now, the mortgage wasn't recorded, but there was a subordination agreement which was recorded which referred to that mortgage. The title company didn't pick the subordination agreement up as an exception (and as it turned out they were right not to). Suddenly our client was sued by the debtor who tried to impose a lien on the land on the ground that our client had notice because of the subordination agreement. The title company defended, and won, after an appeal or two. Our client was hardly bothered with the matter, nor were we. My question is: Who would have taken care of this for us under a Torrens system?

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28) Peter Junger: One thing that we are overlooking is that title plants are computerised in the major cities at least. One thing that worries me with a Torrens system is that title company files are filled with affidavits, inspection reports, opinions of title, etc., which are not available in the public records. How are these privately held documents, upon which the security of a lot of perfectly good titles rests, going to get into a Torrens system? A good title plant is worth millions of dollars. I doubt if the information that is contained there can be expropriated without compensation. And some of those million dollars represent the cost of computerizing the title plant. Another advantage to the present system is that I can get a reputable local title company to get me a report and insurance on land anywhere in the U.S. Land titles aren't standardized, but title insurance policies are. There are states where no title company is big enough to insure a large manufacturing plant, but

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that is no problem, one can--and should--insist that the risk be spread among several carriers. How would that work with a Torrens system? The clients I represented would still want title insurance, even if the land were torrenized. Doesn't that mean that the Torrens system would simply add to the cost?

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29) Peter Junger: Here are some more problems which I do not believe any system can handle well, but which will be aggrevated by a Torrens system's claim that landowners have a certified good title. There is the recurring problem of boundaries which move, strangely enough the states which have the least water seem to have the most difficulty with avulsion. And then there are Indian claims under the Non-Intercourse Act. What would have happened to a system in a state like Maine where it turned out that 50% of the land titles were bad. (Of course, the Indians would be ripped off--again--in either case, but my question is what would happen to a Torrens system in a state like that?) One of the unpleasant facts about real estate--if only because of poor surveying--is that all land titles are "iffy." Having some local court certify that they are good won't make them good, it will just cost money. One of the nice things about title companies is that the judgment calls can be passed off to them. From the viewpoint of both sides, a real estate contract should provide that "seller shall deliver and purchaser shall accept such title as XYZ Title Company will insure at its standard premium for a policy in the amount of the purchase price." Or something like that. I have rusty boiler plate. The title company has to back up its judgment by accepting a risk.

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30) Peter Junger: And here are two more concerns. I mentioned Indian land claims. Thinking about it, I realized that after the treaty of Guadalupe Hildalgo a system somewhat like the original steps in torrenizing land was set up in the Territory of New Mexico to determine the validity of land titles. The result was, of course, that most of the claimants whose title depended on Spanish or Mexican law were deprived of their birthright. People are still being killed in New Mexico over these issues, are were a few years ago. A torrens system will undoubtedly be good for our new colonists, the large scale developers. I can't see that it will be good for anyone else.

The other concern is what happens to disputes about boundaries, especially when one parcel is torrenized and one isn't? Won't a Torrens system have to change the law with respect to informal boundary agreements? It has to change the law on adverse possession. And what about negative recipricol easements? There are so many things which affect title which do not appear in the land records that you are either going to have to have a radical change in the law, for no purpose other than to make the system work, or every land transfer is going to have to include the expense of an action to quiet title.

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31) Larry Eisenberg: Peter, you got to my "wandering" borders before I could and you have hit a real pain in the butt when it comes to Torrens Systems. This is also a problem with tidelands where many acres can come and go over a relatively short period of time. Then, also, landfills cause another problem. Then, of course, the Treaty of Guadelupe Hildago still comes up every now and then (witness the U.S. Supreme Court as recently as this past term). For those of our readers who are unfamiliar with that Treat -- it refers to the Mexican land grants to the United States after the Mexican wars (wasn't that California, Arizona and New Mexico?) The treaty provided for the preservation of Mexican land grants and property rights of both land and personal property owners. This treaty also fixed California's (and other states') community property laws into our common law.

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32) Jim Omura: These problems aren't as significant as you think. The answer to the question of 'how do you cope with these problems under a Torrens?' is simply another question: how do you cope with them without Torrens?

The real answer is in the con version from non-Torrens to Torrens. Under the Land Titles Act, R.S.O. 1980, the system works something like this:

1. Do a complete normal search of title as under the Registry Act.

2. Notify the Director of Titles and supply him with your search and a survey of the lands.

3. Public Notice is given for a period of time, within which all those claiming adverse Title *must* notify the Director of their claims.

4. Administrative and Judicial processes are called upon for deciding disputes.

5. Adverse claims not made within the specified time are barred forever.

6. *No* right of adverse possession can be made in re. lands under Land Titles (unless it is later removed from Land Titles)

7. A compensation fund is set up for errors made by the Director. Note--the *only* claim against the fund is for an error, *not* for adverse claims generally, and the Di

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33) Jim Omura:
rector can claim against a surveyor for a false or faulty survey.

Now, as for the California prob lem where land can literally appear or disappear from the face of the earth, the legislature is going to have to decide who gets and who loses.

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34) Larry Eisenberg: Let's just say that it's more fun with the current system. I mean, can't you just see going out on a nice California sunny day and following your line of sight from that old oak tree for a hundred rods, or so, to the stone hill? Some of these descriptions are really interesting. But,, our current system seems to work rather well. Our title companies have every square inch of land in a computer, with complete title information, and it's a snap to do a search of any kind. At this late date, the only people who would benefit from the Torrens system in California would be the lawyers. So, what else is new?

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35) Peter Junger: I do not see that it is worthwhile to get rid of the law of adverse possession just to have a land registration system for which there is no demand. The ability to cut off claims simply by telling those who are to be cut to speak now or forever shut up, probably does not exist in many of the

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individual states of the United States, because each state has a due process clause (or its equivalent) and many of the state courts (though one can't be sure which ones it will be) will hold such a provision a violation of due process. I would suggest that a regulation of title company rates would make a lot more sense--I don't know if they are too high or not. I do know they are worth it at their present rates but I don't know if they make excessive profits or not.

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36) Gerald Bennett: 0The objections I see are based either on the fact that we have always done it that way or that we cannot preserve out outdated modes of title creation or that surveyors make mistakes. Granted that mistaken surveys are terrible - and I can think of a number of cases I handled with erroneous surveys (in one case a line of pecan trees taken from a grove) or with erroneous descriptions. But these problems exist in any system. There simply is no reason why, given sufficient notice (due process) and right to hearing to establish a claim (dp), the right to counsel (dp) etc., a jurisdiction could not establish such a system. To say there is no demand is simply to say that the only people numerous enough to complain at any given time are the lawyers and title agents. The buyers, who pay outlandish fees for the insurance, most of which is unnecessary or excludes what they really need it for, (including erroneous surveys, in my jurisdiction!) gripe when they close the transaction, but then let the matter rest.

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37) Peter Junger: My trouble is that I can't see any advantages to registration. It looks as if it will increase costs and make unavailable the services one now gets from title companies (for a price). Party wall agreements, boundary line agreements, adverse possession, and things like that are not the result of survey errors. The physically observable facts are as important as anything can be in the purchase and sale of real estate. How does Torrens take care of them? What are going to be the rights of tenants in possession (with say an option to purchase). Are all leases going to have to be registered to protect tenants? And once again, what is going to happen in those jurisdictions which recognize negative reciprical easements? To adopt such a system would require a complete reconsideration and codification of most of our land law. As an academic I think that would be fun, but I can't place my amusement ahead of the potential damage to an unsuspecting public. Our system has evolved; replacing an evolutionary system with a poorly designed one assures disaster, replacing it with a well designed system invites disaster. There are just too many unknown unknowns.

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38) Gerald Bennett: I see nothing wrong with requiring a tenant to place such a lease on record. It need not be the full document, but should be enough to give notice. We have a developed body of law on notice, actual notice, etc., of things which have occurred and which people do not bother to record. Why should not recordation be mandatory to achieve the gains of ease of searching, etc. I still contend that the main reason the subject is denigrated is that people are just used to the old way of doing things. In fact, the abstract companies do just what I am suggesting, though not through computers (or maybe through computers!). There is no reason this should not be a public function.

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39) Peter Junger: Of course most of the objection has to do with a preference for the known over the unknown. But surely the proponents of change have the burden of proof. Of course one could require tenants to record memoranda of leases or loose their rights. But is it desireable? It would be for real estate operators. I very much doubt if it would be for tenants. The Torrens

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system was based on a system of registration for boats which move around (and don't last forever). Something like it works very nicely for automobiles. But that doesn't mean that we should start treating land like boats or automobiles. Nobody is going to be able to hide the back forty or sail it out of the jurisdiction.

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40) Marvin Green: I think the ultimate question is, What kind of land title system should we have? And then. If we don't already have that system, how do we get there from here?

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41) Peter Junger: Not being philosophically inclined, I am not convinced that we need to ask the ultimate question. Since we won't be able to answer it, it means that we would go on the way we are now forever. I don't object to all change, I just want to be reasonably sure that the change will bring enough benefits to justify the cost of changing. I suspect that the costs of changing to a torrens system exceed the benefits. It will be nice for the big boys, and very bad for tenants and single family home owners. I don't like that sort of distributional change and count it as a heavy cost.

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42) Gerald Bennett: This is where I disagree, Peter. It is the single family homeowner who accounts for much of the title insurance, etc., and who has no bargaining power. I firmly believe that, after the costs of transition (a big after, perhaps, although I'm not so sure) the savings on every transaction would be enormous -- to the single family home buyer. There simply is no excuse to have to buy insurance with premiums ranging into four digits simply because we have established such a convoluted system of abstractions (here read "interests") that we have to insure against that system hiding something that will harm us. I recall a cartoon brought to me once by one of my students in which the cartoonist had drawn "springing uses," "shifting uses" etc. Why perpetuate the sort of convoluted mess we have created?

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43) Jim Sprowl: Peter, I think you miss the point of Torrens. Torrens cannot clear up the problems inherent in bad surveys, land erosion, and the like, but the existance of the Torrens system does not necessarily imply that the underlying documents do not exist. You can still dig for such information when a dispute arises (and the less information there is available, the less it costs to search and litigate).

You can purchase title insurance for land in Torrens, and guess what? It costs far less than regular title insurance. The cost of searching is less, and the risk to the insurer is less because of the Torrens title guarantee and fund.

But the big advbantage of Torrens relates to getting all the liens recorded on one document. If they are not recorded on the State's copy of the title, they cannot affect the title. Compare that to a system where thousands of documents can potentially affect a title and need to be checked out. It puts the burden upon the claimant to see to it that the lien is properly recorded upon the Torrens title.

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44) Peter Junger: If the idea is to get rid of springing uses, Torrens systems don't purport to do it. There I agree with Jim. If a Torrens system still allows one to get title insurance at a cheaper price, I would be for it. But I don't believe that the price savings would, in most jurisdictions, reduce the total cost, because in most jurisdictions the initial costs of torrenizing all the land would be so high. And I still don't see how Torrens isn't going to make a real mess because it can't deal with the fact that the basic way of asserting a claim to land is possessing it. Again, I might be persuaded that we

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should abolish the law of adverse possession, but it would take an awful lot of arguing to persuade me. Part of the problem comes from the fact that our present recording systems work more efficiently in some jurisdictions than in others, so there is probably no way of generalizing about the relative merits of recording and registration. BUT SURELY WE CAN ALL AGREE THAT THE BEST WAY TO SAVE CLOSING COSTS IS TO SHOOT ALL THE REAL ESTATE BROKERS.

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45) Jim Sprowl: In Illinois, most Torrens property went into the Torrens system at the time it was subdivided. While it is expensive to put a single parcel into Torrens, it is quite inexpensive for a developer to put an entire subdivision in and then issue 450 torrens titles to the new owners. That is why we have both systems running in parallel.

One of the problems with the chain-of-title system is the fragility of the records. In Chicago, we had a small fire back in 1890 which destroyed all the land records in the county. The Chicago Title Insurance records were the only ones left, which explains why title insurance is so heavily relied upon as an alternative to an attorney-conducted title search in Chicago.

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46) Peter Junger: I am afraid that Torrens records are equally vulnerable and that any computerized system will be more vulnerable. Leaving aside nuclear magnetic pulses, what is the life expectancy of the magnetic media so many of our records are stored on. The fact that Torrnes systems are good for subdividers suggests to me that it is bad for those who are not so well off. As some sort of an environmentalist I am also deeply troubled by treating land as a commodity. Land is forever, we are transient.

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47) Gerald Bennett: As a most interested environmentalist, Peter, I don't follow your last comment. We have timber leases, in our area we have Turpentine leases, we have people who want to mine peat in one of the most beautiful lakes in Florida. But the fact that one wishes to register land plots by numerical (or similar) designation which would, after all, refer to the frequently more descriptive designations we use now has not impact whatsoever on the problems of environmental protection. I am more offended by the abilities of lobbyists in our state capital to push through whatevr they wish than I am with the fact that titles will be recorded by magnetic impulses.

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48) Peter Junger: I am not worried about magnetic pulses in my objection to the Torrens system. I was just pointing out that (though computerized recording can just as well be used with a recording as with a registration system) if the supposed virtue of Torrens is computer records, that may not be much of a virtue. My second point is directed to the underlying philosophy of the Torrens system, which is that land is a commodity like a boat or an automobile. What is important is the document of title, not the land. I believe that this philosophy has a lot to do with the fact that we do not have a land ethic in this country. I believe that the philosophy of land as just another comm helps explain a lot of the exploitation of land which you and I both object too.

The two points have nothing to do with each other. I was responding in one response to two earlier responses.

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49) David Sherman: Not to get off topic, but I'm curious: in Canada, as in England, we don't actually *own* land. We have a "fee simple estate" of land which is technically the property of the Crown (at least under the old, non-Torrens, registry system). How is this dealt with in the U.S.?

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50) Peter Junger: In the US land is generally held aloidially. There may be a few states in which the land is theoretically held of the state, rather than outright. This makes no difference in the real world. The more interesting question is whether you can hold a fee simple of some lord other than the sovereign. In England it has not been possible to create such lordships since 1290 (the Statute of Quia Emptores). In the U.S. it may be possible to create new lordships in Maryland and perhaps in Pennsylvania. There are some cases involving the van Rennselaer family in New York, where they got almost exactly the same result using perpetual rents and rights of entry for condition broken. Their lawyer was Alexander Hamilton. They had larger feudal holdings in the U.S. after the revolution than any feudal estate in England. They finally got worn down by open warfare (the Renters Wars). The modern cooperative apartment with a perpetually renewable 99 year lease comes very close to a fee simple held of a lord (in this case the cooperative corporation). But I am afraid that people who draft modern cooperative leases don't realize that they are reinventing the feudal system.

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51) Larry Eisenberg: Oh. Seems to me that the tenant generally learns who the landLORD is!

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52) Peter Junger: But the modern tenant who has a landLORD does not have a fee simple, which is the point at issue. The question is whether O can convey a fee simple to T, which T holds of O, the way all land in England in theory is held of the Queen.

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53) Larry Eisenberg: I think I'll pass on that. Quite frankly, I've never understood ow a condominium owner could hold a fee simple in some space which, quite possibly, could "disappear" (e.g., fire or earthquake, etc.).

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54) Peter Junger: The space won't disappear, just the improvements. Much worse is owning land on the bank of a river and then having the river moe the wrong way.

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55) Jim Omura: Larry, how can anyone living in the state of California not comprehend owning land which which could disappear over-night? We on the sane side of the San Andreas have always wondered the same about all of you.

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56) Larry Eisenberg: Just remember, when I'm owning this delightful piece of an island just west of the sea coast of Nevada/Arizona, all of you guys are going to be insanely jealous. Just think of the land values, then. Hawaii, look out!

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59) Jim Omura: Just to be accurate for the sake of the publication, I checked the Land Titles Act to make sure all my points were right. I was in error as to the power of the Director to go after a surveyor directly for a misrep. as to the survey. His right of action seems to be limited to going after the person who applied or who acquired title. That person would I presume have the right to Join the surveyor or bring his own action.

Also, surveys can be waived under s. 139 (3), but I don't know of any case off hand where it was done.

Also, there is a possibility of registering a "qualified" title, where appropriate (where a cloud on title remains).

Lastly, the notice provision is in fact pretty minimal, but the Director

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seems to have a discretion to order more notices, and the fraud or negligence of the person applying for First Registration or who obtains title is actionable both civilly and quasi-criminally (maybe even criminally as well). So broad notice is to be recommended anyway.

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[Responses requesting and granting permission to reprint this item omitted.]

RESPOND, FORGET, OR PASS:

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From Mail to Conferencing:

Experiences of a Middle Management Group

Ellen M. Pearson
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University of Guelph Library

The University of Guelph Library system is based on a subject divisional structure housed in a central library. The Library's management system can be described as consultative, in that all librarians and other professional staff (to greater or lesser degrees dependent on their position within the Library's personnel classification system [Table I.]) participate in the decision making process, within the framework of mutually established library goals and objectives. Recommendations for action in the area of concern of a committee or task force are sent forward (through minutes or similar form of communication) to the Library Administrative Council or to the Division Heads Committee. The Chief Librarian is ex officio member of all committees. The Library Administrative Council (Chief Librarian, Associate and Assistant Librarians) is responsible for policy, planning and budgetary matters, as well as participating in various University-wide and other external committees and functions. The Division Heads are directly responsible for the day-to-day operation of the Library system and participate in broader management through the Library's committees and task forces; members of this group may also serve on University level committees.

Before 1982, our communication patterns were fairly traditional: formal meetings followed by minutes; conversations that sometimes became informal meetings, usually followed by various memos; telephone conversations and inevitable rounds of telephone ping-pong. Several members of the group had access to one or more electronic messaging systems, but use was not widespread and tended to be restricted for technical and budgetary reasons.

Early in 1982, the Computer Communications Group of the Trans Canada Telephone System initiated the one-year iNet Field Trial. The iNet Gateway is an intelligent network concept offering a single point of access to meet business information needs. A wide range of features - electronic directories of available servies, automatic access to connected hosts, elec-

tronic mail, individual user profiles recognized by the network and consolidated billing - create a user-orientated information environment. The iNet Gateway was designed to simplify the process of gathering, using and communicating information, and can be entered from any location in the country using standard alpha-numeric or alpha-geometric terminals via Datapac, DDD (direct distance dialing) or dedicated circuit service. Through Datapac access, iNet can link to the United States and other international packet switched networks. Beginning in July 1982 (though not fully operational for several months) the field trial involved some 250 Telidon units plus about 150 alpha-numeric terminals with gateway access to the features of the intelligent network.

As a member of the Bibliographic Interest Group, the University of Guelph Library participated both in the iNet Field Trial and in the Market Trial that followed. This Common Interest Group was co-ordinated by the National Library's Office for Network Development, and included the Canada Institute for Scientific and Technical Information (CISTI) as well as the libraries of Carleton University, Universite de Quebec, University of Guelph and the University of Waterloo. The Bibliographic Interest Group's overall objective was to demonstrate the extent to which new telecommunications technology could facilitate access to library and information resources, and various proejcts were undertaken to support fundamental tasks perfomed by libraries to meet the information needs of their users - information provision, cataloguing and interlibrary lending.

In addition to the group projects, the University of Guelph Library decided to mount an in-house project: to make electronic mail available to its management group in a test setting as near to ideal as possible. That is, to place a terminal on each manager's desk, at least as close as the telephone; to link this terminal to Datapac and iNet via the campus communication network, and to remove any cost restrictions to the us of electronic mail. The first two conditions were accommodated within the Library's budget, and the third was provided to us by the Computer Communications Group as part of our participation in the iNet Gateway Field Trial, and was the electronic mail service now known as ENVOY 100.

Twelve of the thirteen iNet-allocated accounts were assigned to members of the Division Heads Committee. Unfortunately, for technical reasons, the number of accounts per institutional member was severely limited, and we were unable to include all members of the Committee (which resulted in a less than ideal situation for a variety of reasons). The last trial account was reserved for the interlibrary lending project.

During the iNet Field Trial, most members of the Division Heads group became committed electronic mail users: signing on regularly to check our mailbox, becoming more comfortable using a keyboard, and contributing and responding to messages. The time-independent feature of electronic communiction was much

appreciated, as was the ability to communicate with travelling members of the group, whether momentarily away from the office or actually out of the building or off-campus for a more extended period. As the group became seasoned electronic communicators, moving from passive to active users, we began to force the mail system beyond its design capabilities. For example: a message that began as a communication between two, perhaps copied to one or two others, would be forwarded by one of the recipients to several others; each recipient might then respond within one group or layer, but participants in the other layer were often missed - or copied more than once! And the 'copying' and 'forwarding' duplicated text unnecessarily. The forwarding function also reversed the natural chronological order of the messages, so that one frequently saw the answer(s) before the question.

Fortunately, at the same time as the twin needs for wider availability and more sophisticated methods of electronic communication were becoming apparent, the campus computer conferencing system was moving through its development stages. Two members of the Library group were actively involved in its initial development, and continue to be vigorous CoSy users. Because of our iNet experience and our expressed needs, the Library group was asked to participate in testing, and we moved from electronic mail to computer conferencing.

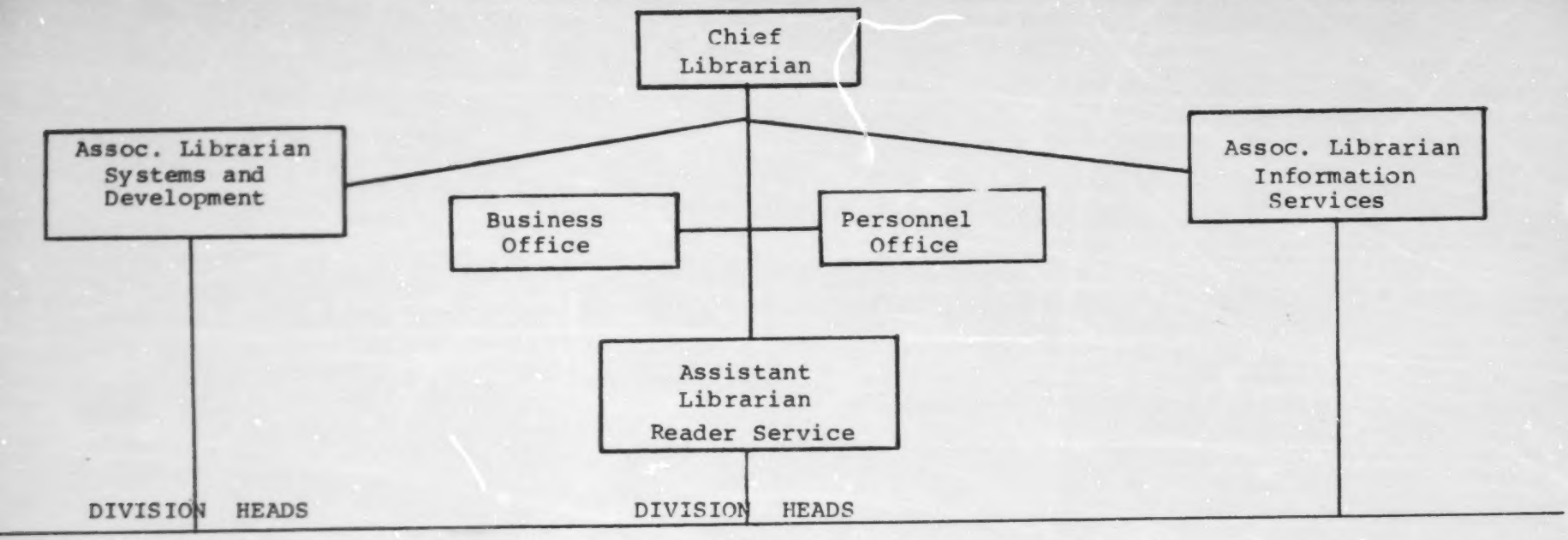
Again, there was a change in communications patterns. The conferencing facility permits chronological communications, and allows newcomers to a discussion to read the history before contributing. The ability to add 'comments' to a specific message in a logical chain eliminates the convoluted forwarding chains of a mail system. It is now possible for several users to set an agenda and conduct preliminary discussion as a conference or conversation, before a face-to-face meeting begins. Those attending the meeting arrive more fully briefed, with each participant having the same backgroupnd information on which to base decisions. In addition, conferencing makes it much easier to solicit information, comments or opinions from others who might not be attending the actual meeting. In some instances, the meeting itself is held electronically - either over a defined or limited period of time, or on an on-going basis. The conversation feature permits one or two members of a conference to 'step outside' for a short discussion, without interrupting the meeting, and, if required, the result of the 'aside' can then be transmitted into the main conference. Also, regular use of private or confidental conferences between line supervisors encourages frequent discussions and improves the traditional lines of communication without taking either staff member from the work location.

Since CoSy has become 'publically available', the number of library staff users has increased dramatically, and now includes all supervisory staff, as well as most of the professional staff and several from the support staff group. Although we cannot provide workstation access for all these, terminals with campus

network connection are available for public use. We have noticed that the Division Head group now uses CoSy to keep the supervisors informed and for two-way communication with them.

Although the conferencing system we are using also provides electronic mail, the one feature of the previous electronic mail/messaging system that several of our group mourned in passing was the electronic filing cabinet!

In addition to facilitating and enhancing already established communication pathways, using the computer conferencing system has opened channels that did not really exist before, resulting in broader exchanges of information among many groups of staff members. At the same time, we have noted a dramatic reduction in the flow of paper around the place, and the reduction continues as more staff members sign on to conferencing.



Acquisitions & Collections
Circulation
Technical Processing

Building Manager
Systems & Data Processing

Documentation & Media Resource Centre
Humanities & Social Science
Science & Veterinary Science

Information Desk

Publicity & Liaison Librarian

Co-ordinating Commitees

Library Administrative Council
Collections (includes several sub-committees)
Disaster Planning
Display
Doc. Centre Materials
Division Heads
Orientation & Bibliographic Instruction
Presentation & Publications Co-ordination
Professional Staff
SIS Co-ordination
Supervisors
Systems Planning

Task Groups/Ad hoc Committees

Search Editors
Videotex
Public Service Procedure Manual
Circulation/Catalogue Systems Interface
Library Response to the University's Aims & Objectives Report

LIBRARY ORGANIZATION
University of Guelph
January 1985

Social Issues of Computer Conferencing

Session Chairman - Ralph Overend, National Research Council

Tom Carey
Computing and Information Science - University of Guelph
Group Productivity: Beyond Conferencing

Mike Lougee
Institute for Social Research - University of Michigan
Social Psychology of Computer Communications

Warren Thorngate
Department of Psychology - Carleton University
Social Psychology and the Design of Computer Conferencing Systems

Ted Swart
Institute of Computer Science - University of Guelph
Some Preliminary Reflections on the Social and Human Aspects of Electronic Conferencing

Group Productivity: Beyond Conferencing

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Workshop on Computer Conferencing and Electronic Messaging
Guelph, Ontario, Canada
January 22-23, 1985

ABSTRACT

Group productivity is the latest buzzword in the office systems marketplace. Vendors of workstations and word processors are promoting physical links to connect individuals; vendors of shared-resource systems are looking for ways to take advantage of their natural potential for shared work.

Computer conferencing should be a required function for the next generation of office systems, given the right fit with other parallel developments which are emerging in the integrated electronic office. Conferencing will have a unique role in meeting the need for better contact amongst people with shared interest, better collaboration amongst people with shared work objects, and (possibly) consensus to form shared decisions. Supporting group productivity in these ways raises new social issues, including new definitions of privacy.

GROUP PRODUCTIVITY: BEYOND CONFERENCING

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ABSTRACT

Group productivity is the latest buzzword in the office systems marketplace. Vendors of workstations and word processors are promoting physical links to connect individuals; vendors of shared-resource systems are looking for ways to take advantage of their natural potential for shared work.

Computer conferencing should be a required function for the next generation of office systems, given the right fit with other parallel developments which are emerging in the integrated electronic office. Conferencing will have a unique role in meeting the need for better contact amongst people with shared interest, better collaboration amongst people with shared work objects, better co-ordination amongst people with shared schedules, and (possibly) consensus to form shared decisions. Supporting group productivity in these ways raises new social issues, including new definitions of privacy.

Introduction

The tool environment supporting office work is undergoing a steady evolution towards the 'electronic office'. Long foretold by optimistic vendors and worried editorialists, the change is coming much more slowly than equipment suppliers have been hoping. Like other great electronic bubbles on the corporate scene (remember how management information systems were going to revolutionize managerial jobs?), the support environment for office work will arrive at its own pace and in quite different ways than our first technology-driven dreams had envisioned.

The vocabulary of the new office has progressed from office automation (ugh!) through integrated office systems to today's term, office communication systems. This progression reflects a growing understanding of the office as a complex network of information, formal and informal roles and interpersonal dependencies. Individual tools which address a single aspect of office productivity are already in place, but we are only beginning to explore the support of group processes.

Group productivity, group expertise, connectivity, collegiality, workgroup computers: these are the latest buzzwords in the office systems marketplace. Vendors of workstations and word processors are promoting links to connect individuals; vendors of shared-resource systems are searching for ways to take advantage of their natural potential for shared work. Research studies of the office are focussing on the collaboration amongst people to accomplish their task [1-3].

Computer conferencing would appear to be a required function for the next generation of office systems. However, it seems to have been largely ignored, to judge by the products now available. The vendors of office communication systems (and the marketplace) have regarded conferencing as a tool for use over long physical distances. Having realized the major role of local workgroup communication in office productivity, the vendors have not appreciated the impact of conferencing on this communication. They have focussed instead on other technological aids to connect individuals, to support collaborative work and to enable group consensus.

In the sections which follow, some of these new developments are highlighted, along with potential contributions which conferencing might add. The computer conferencing community and the office systems community seem to rarely bring their progress together. These two groups share a great deal of common ground, and have much to learn from each other.

Sharing Information

The major tool for interpersonal contact in office communications systems has been electronic mail. Systems are now emerging with basic amenities like selection of only urgent messages for display by title, and (optional) notice that a message has been received by sending of your customized acknowledgement. Of course, the potential for automatic acknowledgements to engage one another in a net crashing flood of messages is well-known.

As a simple contact device, electronic mail leaves unresolved the question of who to contact. In large organizations, this is a major problem hindering interdisciplinary work. Consider the case of so-called 'expert systems', a knowledge-based tool for which supporting technology in simple applications is now readily available. It is a common experience for a research-intensive organization to have several independent projects underway in expert systems, with nobody really aware of the total involvement. These groups could have very beneficial collaboration, if only they knew of each other's existence.

As another example, consider a large university campus like this one. There are many people who share my interest in social impacts of computer systems, but we only find one another by chance encounter or word of mouth referrals. Apparently, many of us used to search for kindred spirits by scanning the publications list in the University newsletter--at least there have been a surprising number of complaints when that listing was recently dropped. One correspondent summarized the joint concern: "I learned from the newsletter that a colleague was working in an

area that impinges on my own fields of study, and the result was a beneficial consultation."

We could suggest that public relations space in the newsletter is a scarce resource, and the publications list could more easily be kept online to be scanned by anyone interested. A simple database, or even conference, structure might be acceptable, in which papers building on one another had reference links.

The real worth of such an online source would be the potential for search by keyword, author, etc. The director of computing services might be interested in knowing about any additions which have *computer* or its derivatives as a keyword. The next generation of office systems will have such facilities, whereby data-oriented triggers can be set up by a user to watch for certain values appearing.

In the underlying software, the processes implementing these triggers are usually called *sprites* *. While the publications list may be stretching the conference mechanism, the notion of sprites on a conference has interesting (perhaps disturbing) implications. If some large portion of our workgroup communication moves through electronic mail or computer conferencing, the potential exists to give wider exposure to the topics under discussion.

Suppose I make public the keywords or titles attached to any messages, by allowing other sprites potential access. If someone else has a sprite watching for messages on social impacts of computers, a message of mine could trigger a notice asking me to contact the sprite's originator if I wish to join in a discussion on that topic. The originator might or might not be identified; if I choose not to reply, the originator never knows of my interest. I gain the knowledge that someone else is interested in the same topic--public availability of such knowledge is the risk taken by the sprite's originator.

You can easily think of variants for this scheme which have much more disturbing social consequences. But we need to note that privacy can be multi-levelled: my message content could be private, my topics could be private, my conference could be entirely hidden, my existence as a conference member could be disguised, and so on. I would be quite willing to at least try out a scheme which sacrificed privacy about what topics interest me for a chance at wider collaboration.

This same potential often strikes me when I take a book out of the library from an area outside my own professional discipline. When I check out a book of poetry, I can see whether it has circulated recently. I think it would be at least interesting, and possibly very productive, for the next person taking out that book to be able to leave a message for me suggesting discussion. As long as I can remain anonymous until I choose to take up the invitation, it looks to me to be worth trying.

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* In Unix systems, they are usually called 'demons'. Draw your own conclusions.

Shared work

The most recent office systems allow work objects to be shared and intermixed freely. For example, I may send you a document in which I have incorporated some spreadsheet tables and graphics derived from them. In your copy of the document, the spreadsheet retains its usual functionality: it is not just a table of figures, but an active object+ on which you can do projections and various other manipulations. The graphics in the document retain their link to the spreadsheet and change accordingly.

A computer conference discussing budget alternatives might well benefit from an ability to include spreadsheets as items, with reference links for new versions. The research questions are quite interesting: for example, we would need to distinguish amongst the different possible changes, ranging from a different view of the same table to changes in the underlying formulae.

A major problem with sharing active objects is this need for control over changes. In this regard, the structures which have evolved in conferencing for organizing discussions, should have some contributions to make with regard to shared work objects. There is ongoing work on synchronous changes through closely coupled workstations and layered network software [4,5], but I am not aware of any investigations linking conferencing to shared objects outside the production of standard text.

This may be particularly helpful in developing expert systems. A "knowledge engineering" process involves formalizing the experts tacit knowledge into explicit form. This has until now taken place through extensive face-to-face encounter. As we come to understand this process more, it seems like a natural application of computer conferencing, especially where the expertise may be spread across people and locations.

Shared work objects have also received study in situations centered on group decision making. The combined hardware, software and human facilitators has been termed a *group decisions support system* [6]. Such a system allows participants in a meeting room to create and exchange work objects through computer aids. For example, members of the meeting may each prepare a subjective probability histogram for various sales levels, using personal computer tools. The individual histograms can be displayed for all to see, or combined into one display of the group's average histogram. The group exchanges are controlled by a facilitator with appropriate software tools (and group process expertise).

This ability for a moderator or other conference member to manipulate individual entries into some composite form would seem to be applicable to asynchronous conferences as well as synchronous decision meetings. Group decision support systems employ other tools like decision trees and procedural flow charts which might be equally useful as active objects in conference items. We know that group decision making, via computer media, is affected by the features of the support environment [7]; new

+ the term *active object* is used in Alis, the office product from Applix Inc.

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features like active objects will have new, and probably complex, impacts.

Shared Schedules and Procedures

Recent work on conferencing has explored the roles and structures needed to co-ordinate group work involving a shared schedule of activities [8]. Similar structures are characteristic of current developments in office communications systems, and have appeared previously in large scale software engineering projects.

Communication-oriented tools supporting software development projects have always been overshadowed by tools and techniques intended for individual use. The latter *solitary tools* need to be supplemented in large-scale projects by *contact tools* [9-11]. A variety of projects demonstrated the value of contact tools for co-ordinating development schedules, notifying groups regarding changes, reporting problem areas, and generally structuring project-oriented communications.

These projects were driven to use contact tools by virtue of physically distributed project teams. The ideas were not carried over to large scale projects in single locations. When distributed development projects faded in prominence, structured contact tools faded with them, although some organizations continued to use less structured electronic mail as an integral development team component [12].

Similar ideas about managing work processes by structuring communications have emerged from research in office communications systems. The central notion is a procedure describing work flows between individuals (more precisely, between role players). For a specific instance of the procedural, a *work package* moves electronically from one contributor to the next**. As a simple example, an employee data form originates when a person is hired. It circulates in parallel to several people for authorization, then is forwarded to the personnel department when complete. As a more complex example, the work package could be an annual report being written by a team.

Management of the procedure is aided by the structured movement of work packages, as well as the ability to track individual packages or monitor overall system activity. Since the messages in the system are of specific types related to the procedure of which they are a part, it is possible to ask questions like, "How many employee forms have been waiting for completion more than one week (and where are they)?" General policy restrictions can be imposed by rules which apply to all procedures [13].

These systems do not yet exist as commercial products, but research prototypes have reached the point where commercialization is almost inevitable. The major issues still to be resolved is a satisfactory user interface for describing the procedural flow [14].

** The term *work package* is from the Lonex system of the USAF in Rome, NY.

How does computer conferencing relate to these highly structured message flows? In the current prototypes, conferences are not included. Though there is some provision for exception handling through messages between individuals, no thought has been given to group contact. But in the future, we can foresee the need for group discussion linked to the work packages and procedures. That is, a work package in a given procedural step may be the topic of a discussion using computer conferencing as a medium. Someone tracking that package will need to be informed of the conference link and be able to join in. In the other direction, the conference may need to make reference to other packages, in ways which allow conference members to access the contents or procedural history of the package.

Conclusion

The considerations above lead us to conclude that

--as office communications systems convert more work to electronic media, the need for group discussion through conferencing, or similar structures, will also grow.

--addition of conferencing to office communication systems has been hindered by its association with physically distant users, at a time when the local workgroup is the focus for office systems

--conferencing must be integrated into other office system developments, to interact with active objects, work packages and procedures.

One additional impact of office systems developments on conferencing is the emergence of objects mixing text and (digitized) voice. It seems reasonable to envision a significant minority of office workers having access to combined voice/text document facilities, say 10-20% in five years. The technology will be in place to create conference items in either medium or a mix. How much of the etiquette that has evolved in conferencing communities will still be relevant in this new context? How much of our human factors research on message content and discussion style will prevail?

Any proliferation of electronic communication will have social impacts which we are unlikely to foresee from our current perspective. We can see both the promise and the pitfalls of wider access to the communication space. The complexity of modern organizations may seem to force us in this direction for effective contact and co-ordination. But increasing reliance on communication tools may mean those with the strongest tools come to subtly control the process. We may find, as Ivan Illich suggests, that "computers are doing to communication what fences did to pastures [15]."

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Social Psychology and Computer Communication

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Workshop on Computer Conferencing and Electronic Messaging
University of Guelph, Guelph, Canada
January 22-23, 1985

ABSTRACT

The goal of this presentation is to review a broad range of topics from social psychology which are relevant to understanding computer mediated communications. A taxonomy of relevant theory and research methods will be outlined, followed by a more detailed analysis of a few specific research topics.

The scope of appropriate social psychology is wide, from laboratory-measured cognitive behaviour to field studies of bureaucratic organizations. The list of topics to be mentioned in the broad review includes social learning and imitation, person perception, development of social norms, social participation, depersonalization and social anonymity, group problem solving and productivity, etc. More detailed analyses will address status relations and interpersonal persuasion in electronic groups.

Finally, questions will be asked about why social psychologists should be interested in computer communications. Is it simply that the electronic communication medium permits testing the generality of known social psychological principles, principles derived from face to face social interaction, or are there also unique opportunities for important social psychological research?

Social Psychology and the Design of Computer Conferencing Systems[1]

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presented at the
Workshop on Computer Conferencing and Electronic Mail
University of Guelph, Guelph, Canada
Jan. 22-23 1985

Abstract

Problems of computer conferencing can be divided into those concerned with the medium, and those concerned with users of the medium. The former are likely to be alleviated by future developments in hardware, software, and funding. The latter are less likely to be alleviated, but the probabilities of their alleviation will be increased by considering the social and psychological constraints of users, and attempting to develop norms, traditions, and rewards for effective participation based upon these considerations. Examples of user constraints and the problems arising from them are given, and methods of circumventing them are discussed.

Introduction

If computer conferencing is so wonderful, why are we meeting like this? There is, indeed, some irony in holding a traditional face-to-face conference on the problems and prospects of computer conferencing. A skeptic might be tempted to conclude from our presence here that computer conferencing is short on prospects and long on problems. We may disagree. But we are ill-advised to dismiss the conclusion with ad hominem epithets (e.g., Luddite, cynic) or self-effacing references to nascence, funding, and the like. For, like it or not, the prospects of computer conferencing as a popular and effective medium of group communication are rather grim unless we can overcome many of the problems of the medium and its users that are now becoming apparent.

What are these problems? Many concern the internal workings of conferencing systems and are relatively easy to identify and solve. Others concern the economics of conferencing and are at present more difficult to solve. The remainder concern user constraints, habits, norms, fears and expectations, and may be intractable (see Thorngate, 1984). Let us consider briefly some of the simple problems, then turn our attention to the more formidable ones.

We have known for some time that most computer conference participants want the conferencing systems they use to be "friendly." We are only now beginning to understand what is meant by the term, and to rethink the design of our conferencing systems in light of this understanding. As a result, we may look forward to second and third generation computer conferencing systems that rectify many of the mistakes of our first generation experiments. For example, some of our "friendliest" conferencing systems now take over 60 unfriendly keystrokes to access (phone number + network user identification + computer selection + terminal profile + signon ID + programme selection). In future, they should take no more than a dozen. Most of our extant systems do not

arrange items hierarchically, do not allow editing text while entering it, do not provide prompts with printed command options, do not print item titles and authors at the end of items as well as the beginning, and come with user manuals that violate every known principle of good documentation. All of these faults are relatively easy to repair, and probably will be in later conference programmes. We may even look forward to a time when conferencing system "features" will stop propogating like rabbits in the name of user friendliness, and when all competing systems will be sufficiently standardized in their features and commandsto give potential users some relief from the the unfriendly task of mastering and remembering several sets of idiocyncracies.

Alas, many of the desireable features of our improved conferencing systems cannot be implemented without a large increase in the sophistication of users' equipment. It is safe to say, for example, that at least 90% of the terminals of today's potential users are slow and dumb. Unlike those of the computing priesthood, these terminals will not run at 9600 baud, will not display graphics, and will not store text for later review. Computer conferences are noticeably limited by these constraints, and will be noticeably improved by their passing.

Which brings us to the bottom line. New equipment is relatively expensive, and in this age of fiscal restraint we cannot expect to receive generous funds to purchase new equipment no matter how much it may increase the quantity and quality of computer conferences. We will simply have to make do with the equipment we have for the next few years. When we can finally replace our equipment, we can expect that our old stuff will be used by others, even more impoverished than ourselves, who wish to try the new medium at minimal cost. Thus, it is safe to predict that equipment limitations will remain in the conferencing community for some time to come, and that conferencing system improvements will be hampered by their existence for an equal length of time.

Issues of cost are, of course, not limited to the purchase of equipment. Computer conferences are rarely free; in fact, most are relatively expensive. Often we compare the costs of participating in a computer conference to those of participating in a traditional conference, and in doing so conclude that the former is relatively cheap and cost effective. But this comparison is not the only one that can be made, and is arguably the least appropriate. The $200 or so it may cost for a single user to participate in a computer conference can buy a lot of phone calls, traditional conference proceedings, newsletters, journals, and other sources of relatively fresh and edited information. Many of these other sources give us the opportunity to examine their informational content freely before we decide to buy it. Most are portable, have graphics, and can be reviewed at no additional cost. Computer conferences have none of these capabilities. Relative to these more traditional media, computer conferences are a very bad bargin. If we expect the medium to be used by those not as rich or as well-granted as ourselves, we must reduce the costs of using it considerably.

We may also wish to consider the nature of conferencing costs. At the moment, the costs of participating in a computer conference are based almost entirely on computer connection time, and on the number of text lines transmitted and received. Together they serve to discourage people from spending long periods of time in a conference, and from reading or writing. This seems antithetical to the purposes of computer conferencing. Alternate charging schemes -- for example, schemes that charge for viewing text but not for viewing titles, or schemes that charge for lines read but pay for lines written -- may provide more incentive to participate in computer conferences.

Social Psychology and Computer Conferences

Improvements in computer conferencing systems and the reduction of conferencing costs should do much to increase the number of people who will at least try the medium. But even with the finest equipment, and even if conferencing were free, there is no guarantee that computer conferencing would be any more successful or effective than it is now. We need only look at citizen's band radio, 8mm movies, audio cassette letters, 3D films, Telidon, or video conferences to realize that many communication media do not enjoy widespread acceptance or use despite their technical features or low costs. Though it may be unCanadian to say so, the medium is not the message. And in the end it is the content of computer conferences, more than their features or costs, that will determine their effectiveness and future use.

At present the "wheat to chaff" ratio of computer conference content is rather low. Most of those who are not enamoured with the medium itself can find little of merit in most computer conferences. In principle this need not be so. Even with today's rather crude conferencing systems, there is little in the systems themselves that should prevent really good ideas or information from being exchanged therein. The dearth of high quality content is attributible to at least two causes. First, most participants may simply have no good ideas or information to share. Second, participants may have good ideas and information but may be unmotivated to share either in a computer conference. The first cause always looms as a distinct possibility. After all, most presentations at most traditional conferences (with some notable exceptions such as those here) are highly forgettable, and it is difficult to believe that their authors are saving better ones for a new communication medium. The second cause, however, is equally plausible. It suggests that we attend to the motivations of potential users in making computer conferences a more effective medium of communication. To do so we must consider the psychological and social factors that can affect the quantity and quality of participants' interactions.

Consider first the social milieu in which the medium of computer conferencing has been introduced. No one has been waiting around in silence for the invention of this new medium. We have survived for centuries with more mundane media -- indeed, we have flourished with them. There are now so many communication media, and so many sources of information in each, that our age may be characterized by media glut as well as information overload. There is simply no vast and virgin communication niche to be settled by computer conferencing; the media market is saturated. Computer conferencing may bring a unique combination of features to this market, but no single feature is unique. It must therefore compete to some extent with all other media having common features. In doing so, computer conferencing must confront long established habits of media selection, well entrenched social and status hierarchies, and rewards offered to those who communicate well by other means.

Media competition is not so much for money as it is for the real currency of information exchange: attention. Most people who might contribute good ideas and information to any medium are preoccupied with other matters. Demands for their attention usually exceed available supply. Most academics, for example, are lucky to find one or two hours a week to read their weekly dose of incoming information. Journals are often skimmed or left unread. Colloquia, textbook advertisements, and reprint requests are ignored. Under these conditions it is hard to imagine someone finding 1-3 hours a week to read and write items in a computer conference. The necessary time would probably have to be borrowed from some other important activity. This may happen if the intellectual or social rewards of the conference were great. But it would hardly be sustained by

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mere curiosity about the medium and its potential.

If those with no spare attention exclude themselves from computer conferences, those with some to spare may still find reason to avoid them. Most people, for example, find writing a painful chore and do not write well. The time and effort spent writing conference items, and the fear of exposing them unedited to critical scrutiny may deter more sensitive participants from writing anything at all. Content may thus be generated by a curious collection of skilled writers and insensitive bores. Others will revert to the role of passive reader, much like those who attend traditional conferences but never speak. In this regard, a computer conference is analogous to any commons, and can suffer the same fate (see Dawes, 1980). Resources (contents) of the commons can be withdrawn by many people who have no motivation to assist in their replenishment. Those who provide the resources are likely to view this as inequitable. As a result, they should soon cease to add to the commons. Thus, the conference will fail (Tombaugh, 1984).

Both social psychology and common sense suggest several ways to limit the chances of this little tragedy. Some are coercive; one could, for example, require that participants enter their own items or comments on a regular basis, or be excluded from future participation. But when participation is voluntary, such forms of coercion rarely produce their desired effect. At best they may induce more quantity and less quality of content, and this is likely to discourage valuable participants from continuing. Rewards are much more effective, particularly social rewards. The promise of publishing computer conference proceedings by traditional means may quickly increase both the quantity and quality of conference content. So too may the opportunity to communicate with friends or acquaintances rather than strangers. The possibilities of reaching clearly stated group goals or of maintaining social contacts are powerful incentives to perform well in face-to-face groups. The same is likely to be true in groups communicating via computer. Groups of people who know each other, and who must act as well as talk, should generate the best computer conferences.

Much has been said of the role of leadership in promoting high quality computer conferences. Perhaps this is because no one yet knows what a good leader should do. Social psychology research indicates that the effectiveness of any given leadership style varies with the nature of group members and tasks. Thus, it is unlikely that any single leadership style will be universally effective for computer conferencing. Some form of leadership, however, is always necessary, and this has so far implied that one or more participants spend time in the leadership role. For most conferences, the role is not an enviable one. Leaders are typically responsible for registering new participants, send out bills, encouraging participation, finding more conference funds. Most of the time spent on these tasks is voluntary and unrewarding. If the medium is to develop, some means must obtained to compensate leaders for such dog work, or to delegate it. Fortunately, skilled leaders need not be skilled academics of effective participants. A strong case can thus be made for hiring conference leaders, or administrative assistants, under some job creation programme.

Many of us who have purused the content of several conferences are left with the impression that they often wander, flounder, or regress to a crude form of high-tech chit-chat. These are strong indications that many participants simply don't know what is expected of them, or that participants have come to expect little and to offer little in return. Unfortunately, computer conferencing norms have tended to evolve haphazardly while attention was focussed on developing the technology. At the moment, most computer conferences operate under an odd assortment of norms either borrowed from traditional conferences, ham radio, board meetings and locker rooms, or created on the spot according to some technical limitation or participant's whim. A common expectation seems to have emerged that computer conferences should be informal and ephemeral, and that items should hold the attention of participants for no more than a few weeks.

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Such computer conferencing norms would seem to work against the medium as a serious contender for high quality content. One could argue, of course, that the medium should not contend for this content, and instead should remain an outlet for gossip, shop talk, flaming, and other vernacular or cathartic pursuits. But if the medium is to reach its potential, then high quality, archival material must be produced therein, and norms must be quickly developed to stimulate its production. There are two general ways to develop these norms. The first is to construct and publicize an appropriate set of rules of order. The second is to generate and publicize some examples of high quality conferences. Social psychological research suggests that the second method is more effective than the first. We should thus not hesitate to include excerpts from good conferences in user manuals or other written materials to serve as models for new participants, and to give them a concrete idea about what level of participation they should expect of others and themselves.

Traditional conferences serve two functions. The first is a task function, the second is a socio-emotional one. The former generally occurs in meeting rooms, the latter generally occurs in hallways, parties, and bars. Both are necessary for any conference to be effective, but they must be separated in time or space to have their complementary effects. Most computer conferences make no such separation; formal presentations and informal chatter are confusingly intermixed in computer conference content. To avoid this confusion, we are well advised to hold computer conferences in pairs: one for formal presentations, and one for informal meetings or amusements. The latter may best be served by adjunct electronic mail systems. But all participants should be encouraged to engage in both.

These are some of the ways in which social psychology can be used to increase the chances of effective computer conferencing, and thus to increase the chances of survival and growth of the medium. The application of social psychology will not assure the success of computer conferences. But it should reduce the opportunities for the medium, and its users, to fail.

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Electronic Conferencing
A New Mode of Communication

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ABSTRACT

Certain preliminary reflections on the social and human aspects of electronic conferencing are discussed in the light of actual day-to-day usage over an extended period of time. It seems likely that its extensive use may well have a profound effect on the flow of information within organizations -- facilitating the lateral transfer of information and altering existing status hierarchies.

INTRODUCTION

It is well known that some insects communicate by means of smell, others by performing a ritualistic dance and yet others by means of chirping or other auditory signals. Larger animals such as dolphins communicate by means of high pitched sounds and birds are known to communicate by means of elaborate songs for courtship and other purposes.

Most of these modes of communication allow animals to contact each other at a distance but most of them also appear to serve somewhat limited purposes such as mating, the avoidance of danger, or the sharing of food. Man alone, of all species on earth, has an elaborate spoken language which allows the sharing of information to an unprecedented extent. Quite how long our species Homo Sapiens has existed and quite how long it is since spoken language came into being is difficult to pin down. It is widely accepted, however, that Indo-European -- the precursor of most of the extant European and some Indian languages -- was in existence some 25,000 years ago.

The supplementation of vocal communication by written communication is also difficult to pin down in time but there is at least some evidence that primitive forms of writing arose between 12,000 and 16,000 years ago. Writing was, of course, originally done by hand and the widespread automatic reproduction of written material had to await the arrival of the printing presses of Gutenburg (1400 - 1468 A.D.) and Caxton (1422-1491 A.D.).

Our modes of communication do not, of course, stop short at simple one-on-one oral communication or the dissemination of written material. All of us, in general, and universities in particular indulge in various forms of collective communication which we classify with terms such as committee meeting, lecture, seminar, tutorial or workshop.

Technological Progress

As our technology has advanced the number of modes of communication available to us has increased substantially. The telegraph, the telephone, and the teleconference have all been added to our repetoire over the last 150 years and such technological contributions to our communications ability tend to overcome the barriers of both space and time.

And now there are some new kids on the block including electronic mail and electronic conferencing and it is the contention of this paper that the latter represents a genuinely new mode of communication with a particular suite of characteristics which are likely to make it a very valuable addition to our current modes of communication.

All of these technological contributions have taken place over a very short space of time and the pace is accelerating. Some few years ago Stockton (1981) pointed out that electronic mail is advancing "like an avalanche" and it is little wonder that Daniel Ruby (1984) has suggested that "the technology has bloomed so suddenly that it has outpaced the ability of society to evolve social conventions to deal with it". My impression is that, because of its patent advantages, the use of electronic conferencing is advancing even more rapidly than the use of electronic mail did a few years ago and at very least we need to have some understanding about what it is that makes this mode of communication both different and attractive to its users.

COMMUNICATIONS MODALITIES

I have tried in the accompanying table (Table 1) to set out the similarities and differences between various types of communication with reference to certain key modalities. A tick ✓ indicates that the modality exists, a cross X that it does not exist, and a fraction that it exists to some degree. No attempt has been made to make the table exhaustive and the fractions contained in it are no doubt subject to a wide degree of uncertainty but it does serve to highlight some of the major differences between various forms of communication.

Two of the more obvious differences between face-to-face communication and electronic conferencing lie in the synchronous/asynchronous distinction and the presence/absence of non-verbal cues

	Type of Communication / Modality	Synchronous	Asynchronous	Intonation Cues	Non-verbal Cues	Multiple Participation	Easy Recapitulation	Systematic Recapitulation	Long Range
Vocal	One-on-one face-to-face	✓	X	✓	✓	X	X	X	X
	Committee Meeting	✓	X	✓	✓	✓	1/2	1/2	X
	Lecture	✓	X	✓	1/2	1/2	3/4	1/4	X
	Tutorial	✓	X	✓	3/4	3/4	1/4	1/4	X
	Telephone	✓	X	✓	X	1/4	X	X	✓
	Voice Store and Forward	X	✓	✓	X	1/4	3/4	X	✓
	Teleconferencing	✓	X	✓	3/4	✓	3/4	X	✓
Written	Letter/Memo	X	✓	X	1/8	1/3	✓	1/2	✓
	Report	X	✓	X	1/8	1/3	✓	1/2	✓
	Formal Paper	X	✓	X	1/8	1/3	✓	1/2	✓
	Book	X	✓	X	1/8	1/3	✓	1/2	✓
	Electronic Mail	X	✓	X	1/8	3/4	1/2	X	✓
	Electronic Conferencing	X	✓	X	1/4	✓	✓	✓	✓

TABLE 1.

(about which more later).

Social and Human Implications

The number of papers dealing with the social and human aspects of electronic communication is conspicuously small and the book by Short, Williams and Christie (1976); and the papers by Hiltz, Johnson, Aronovich and Turoff (1980); Hiltz, Johnson and Turoff (1982); and Kling (1982) must be regarded as pioneering ventures in the field.

The latest paper contains the preliminary results of a study carried out by Kiesler, Siegel and McGuire (1984) at Carnegie-Mellon University on certain social/psychological aspects of electronic communication and their paper is an excellent source of relevant references.

They were particularly interested in the way in which electronic conferencing affects the behaviour of participants and they made use of an electronic conferencing system called "Converse" which was developed at Carnegie-Mellon University. From its description it appears to be rather different to more coventional electronic conferencing systems such as COM, EIES and CoSy and more akin to an elaborate 'chat' facility. It makes use of windowing facilities with the contributions of up to three participants being simultaneously added to the screen which is identical -- though physically duplicated and separated -- for all of the participants. The results obtained with such a system may not therefore be strictly applicable to the more usual type of electronic conferencing system.

Kiesler, Siegel and McGuire assumed that the major differences between face-to-face communication and electronic conferencing lie in the absence of non-verbal feedback in the latter and the tendency to depersonalizaiton. They inferred that these differences would encourage the use of extreme and abusive language, increase the range of participants in a discussion, and increase the time taken to reach consensus.

Their results appear to confirm their hypotheses to a large extent but it should be pointed out that the results were obtained within the context of a planned experiment involving the use a a highly structured problem known as a Stoner choice-dilemma (Stoner, 1961). It does not, therefore, follow that their observations apply in every respect to the day-to-day use of an electronic conferencing system for handling real life problems without any extraneous motives or the formal assignment of a somewhat artificial problem. Nor does it necessarily apply to the type of electronic conferencing system in which asynchronicity is more prominent.

Nevertheless, those of us who have used CoSy will be quick to confirm at least some of their findings. There is undoubtedly a more widespread participation by many people who would tend to keep quiet in a committee meeting or seminar. Whilst the tendency to dominate a discussion is still present it is inhibited by the asynchronicity and freedom to take time over ones contribution. In addition the ability to be able to 'talk' simultaneously without being rude is a tremendous asset.

The greater time taken to reach consensus observed by Kiesler, Siegel and McGuire also needs some comment. It presupposes that electronic conferencing is an either/or form of conferral which is far from being the case. As an adjunct to other modes of communication it may well shorten the time taken at committee meetings and/or make them more productive. And in a normal working environment the overall clock time taken to reach consensus might well be considerably shortened.

The electronic fits of rage or 'flashing' referred to by Kiesler, Siegel, and McGuire, do seem to occur but, in my experience, only under circumstances which would have been likely to elicit similar behaviour in a face-to-face encounter.

One other observation of my own is that people sometimes reveal facts about themselves and attitudes which they hold more freely in an electronic conference than they seem to do in face-to-face meetings. They also seem less inhibited about asking pertinent questions. And if these observations are correct then my own feeling is that they are genuine benefits of this mode of communication. In a university environment this might well mean that many more students would be willing to approach their professors with useful questions. It might even be possible to build in anonymity if this was felt to facilitate such a widening of class participation.

It is this apparent reduction of inhibitions concerning the making of a contribution which may well impact existing chains of command and allow hitherto mute points of view to surface freely. This may be very disturbing for some organizations and no doubt there is a place for closed,confidential and even encrypted conferences. Certainly within CoSy the closed and confidential conferences are used very extensively.
As regards the assumed tendency towards depersonalization and the evidence adduced in support of this tendency I am at somewhat of a loss to understand why it is believed to exist in the first place and cannot regard the evidence for it as very substantial. I have not detected, in myself, or in others the tendency to become depersonalized by the use of electronic conferencing, either in terms of feeling like a machine myself or in treating the potential participants of my contributions as any less human than those humans I meet in face-to-face encounters.

Perhaps part of the explanation is that for me electronic conferencing is simply an adjunct to other modes of communication and, to a large extent, the people I 'electronic conference' with are people I have lunch with, meet in committee meetings, talk to on the telephone and so on. And in such a situation it is hard to conceive of any depersonalization taking place. But even in the case of those overseas users, whom I have never met face-to-face, I find that I tend to develop a warm feeling for them as I get to know them better -- by kind courtesy of electronic conferencing.

It would be wrong, however, to ignore the importance of non-verbal cues and intonation as valuable components in face-to-face communication. A nod, a smile, a shrug, a scowl, a look of puzzlement, the raising of ones' voice, speaking slowly and deliberately and many other cues are an important aid to communication in face-to-face encounters. Users of electronic conferencing do therefore feel the need to be able to add emotive content to their contributions and it is perhaps worth examining this area in more detail.

THE CONVEYING OF EMOTIVE CONTENT

In one of the conferences in CoSy I was brash enough to make the following contribution:

> "It is of much interest to me to see how all of us at one time or another, in one way or another, feel the need to add an emotional gloss to our comments -- even if only to show our anger. It illustrates the fact that emotion and logic are frequently both needed in attempting to convey meaning.
>
> Since the word standards frequently has negative connotations perhaps we should speak of conventions rather than standards. Without conventions language would not even exist. Methinks that those of us in this conference should seriously consider publishing an international watershed article on interesting ways of including emotive content in written material with particular reference to electronic conferencing systems. We could include suggestions for suitable conventions together with some ingenious and emotionally satisfying examples of how they would work out in practice."

This paper is not meant to be the 'watershed article' but I think it is worth passing on some of the ideas which emerged.

The discussion was started by Robert Harper of the Department of Microbiology in Helsinki, Finland, who pointed out that users of COM were seriously concerned to be able to warn readers of their contributions when they were being ironic and suggested using the form (.REMARK.) whenever irony was intended. Robert went on to suggest #remark# for innuendo and !REMARK! for shouting.

Other contributors suggested &&remark&& for 'no harm intended', !remark! for 'pun intended', !!!&&&remark&&&!!! for 'hearty endorsement, (remark) for a sly smile, and ^remark^ for a chuckle.

Alastair Mayer pointed out that USENET already uses":-)" to indicate humour and suggested "-)" for a tongue in cheek remark, and "):-(" for an emphatic remark.

There is little doubt that people do feel the need for this kind of thing and the availability of boldface (highlighting), italics, flashing, underscoring, sans serif and so on would be extremely useful. Would that we had 9 bit bytes which would perhaps hasten the arrival of suitable international conventions to facilitate such options. Failing that we will have to wait for a drop in the price of high resolution bit mapping techniques.

CONCLUSIONS

All in all there appear to be reasonable grounds for regarding electronic conferencing as a genuinely new mode of communication. In addition to the characteristics mentioned in the table above we could add in the fact that it acts as an automatic filing cabinet and secretary all rolled into one. With the cost of mass storage dropping precipitously in price and the volume needed for storage shrinking equally rapidly we may soon reach the stage when it is sensible to keep all contributions to electronic conferences permanently on record.

Most of the newer forms of communication tend to undo the Tower of Babel in which we have been forced to live for so many years and I feel sure electronic conferencing will contribute to this end. The system of Arabic numbers has become practically universal -- apart from the Arabs, of course, who use an earlier version peculiar unto themselves. The Roman alphabet has spread to Germany, Vietnam, most of Africa and many other parts of the world and may, in the end, spread to China as well. Both the number of languages in the world and the number of dialects is shrinking rather than increasing.

Some would understandably feel this to be a great loss but if in the process the languages remaining are enriched this can only be

to the good of mankind. According to Charles Berlitz (1984) English having, as it does, both strong Germanic and strong Latin roots, currently has twice as many words as its nearest rival -- German -- and the Germans in their turn are currently importing English words at the rate of 1000 every few years. Japanese has also already incorporated some 10,000 English words -- suitably modified to match the Japanese phonemic structure.

Electronic conferencing is part of this great movement and is likely to be an innovative force in terms of cutting across and augmenting existing modes of communication. To wholeheartedly embrace electronic conferencing will require some degree of courage on the part of upper level management but the rewards are likely to make the risks well worthwhile.

It may well be that the technology IS moving so rapidly that we have little time to adapt our social conventions to cope with the changes but I suspect that provided we try and apply the normal rules of civilized behaviour, as best we can, we will cope reasonably well. The attempt to work out some ground rules would nevertheless be a worthwhile endeavour and the role of a conference moderator is currently one that is in a very nebulous state. For a most part moderators seem to keep a very low profile -- quite unlike a chairman of committee meeting -- and perhaps a more active role by the moderator would be of benefit for most conferences.

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Distributed Computer Conferencing

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The Grand Conferencing System: A Distributed Network of Peer Server Machines

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The Grand Conferencing System: A Distributed Network of Peer Server Machines

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ABSTRACT

The Paltry Computer Conferencing System was developed in 1980 for VNET, IBM's internal network of 1300 computers. Based on the experience gained from that system, the Grand Conferencing System was started. Work continues on Grand to connect the IBM Grand Server Network out into the BITNET and EARN academic computer networks.

Paltry operates as a single server machine which communicates to its users by sending files over the store and forward VNET system. One of several user interface programs could be used to create and receive files from Paltry. Each contribution from a user is attached to a 'parent' contribution to form Paltry's tree (DAG, of documents. When a new contribution was made, a copy of that contribution is send out to all 'subscribers' to the subtree to which it was attached.

To reduce network traffic and improve performance, Grand was designed to use a distributed network of peer server machines which maintain copies of conference data close to the users. Grand has 'style' programs which handle conference data functions, communication functions and user interface functions, which allow Grand to be used for many applications that are not normally thought of as computer conferencing.

The GILT Approach to CBMS Interconnection

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1 Survey of the GILT Standard

Why Interconnection of Text Systems is Needed

Much of the communication in the future world will be through computerized systems. These systems will be used to create, store, organize, distribute, retrieve, and display text items such as letters, papers, news items, abstracts, references, etc. .

Examples of such systems are:

* Distributed electronic mail systems where every user has a work-station for sending and receiving mail through networks.

* Centralized electronic mail systems to which large numbers of users can connect to send and receive mail items.

* Computer conferencing systems in which groups of people can communicate through computer conferences or electronic bulletin boards.

* Electronic publishing systems which may replace part of what is today published in newspapers, books, journals, etc. .

* Information retrieval systems storing large data bases of knowledge, where a user can search for information and retrieve items containing specific information.

Many systems have of course facilities for more than one of the alternatives described above. This is the case in most advanced computer conferencing systems, which usually also have advanced mail systems and retrieval systems. Videotex systems also often combine several of the facilities described above and may offer additional facilities like automatic booking of tickets or ordering of goods.

The future world will not contain one large system like this, but a large number of small and large systems. There will then arise a need for interconnection of these systems, so that information can be transferred between them.

To enable diverse systems to interconnect, there must be a standard for the interconnection of the systems. GILT is such a standard.

Not Only a Standard for Electronic Mail

GILT contains, as part of the GILT standard, a standard for the transfer of electronic mail. GILT is, however, more than a standard for the interconnection of electronic mail systems. It is the belief in the GILT project that a good standard should fit, or be extendible to all the kinds of computerized text systems described above. One and the same document will often during its life-time pass between systems. A document may for example start as a letter in an electronic mail system, then become a computer conference item, then be published in a journal, and then be retrievable in an information retrieval system.

It is the belief in the GILT project that it would be a great mistake to define a standard only for the interconnection of electronic mail systems which would not take into account the needs of the other systems described above.

Purpose of the GILT Standard

The purpose of GILT is to define a standard for the interconnection of all these systems, which we call by the generic name Computer Based Message and Conference Systems (CBMS).

The GILT Standard contains protocols for the interconnection of such systems. GILT is defined so that its standards can be used for the interconnection of many different kinds of such systems. GILT can interconnect small single-user systems with large multi-user systems. GILT can interconnect systems with only one kind of facility (like electronic mail) or with many more advanced facilities like conferencing, bulletin boards, publishing, storage and retrieval. GILT can interconnect systems based on a big central data base with systems based on a distributed network of small local workstations.

GILT does not standardize the interface between local systems and their users. What GILT standardizes is the exchange of information between such systems. Thus GILT is a standard for computer-to-computer communication, not a standard for human-to-computer communication. The way in which the GILT facilities are made available to the local users of a CBMS is not part of the GILT standard.

The GILT Standard does not describe one and only one way in which such systems can be interconnected. Instead, the GILT Standard defines simple basic primitives. The standard does not prescribe how these primitives are combined into more powerful operations. Thus many widely different strategies for the interconnection of CBMS's are possible within the GILT standard.

GILT also contains a standard for the interconnection of TELETEX systems to systems employing the GILT standards.

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GILT Implementation

The GILT project does not only encompass the definition of the GILT standard, but also the pilot implementation of GILT on a number of European CBMS's such as COM, PORTACOM, KOMEX, FORUM, etc.

Open Systems Interconnection Model

GILT is based on the ISO Open Systems Interconnection (OSI) Reference Model 1 , which is a model for the structuring of communication aspects in the interconnection of computer applications through computer networks.

The OSI Model defines interconnection by introducing seven communication layers. The GILT Message Services and Protocols relate to layers 6 and 7 of the OSI Reference Model.

Abstract Model of a CBMS

The GILT Standard defines an abstract model of a CBMS. Every CBMS implementing the GILT Standard will look to other systems as if it corresponds to such an abstract model or to a subset of it.

Real CBMS's will of course not always work according to this abstract model. They will then have a module which maps the GILT model on their real system. Thus, the primary interconnection between GILT CBMS's is between systems working according to the GILT model. They will, however, by the local mappings to the real systems, create an indirect connection between the real systems as shown in the following figure:

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A CBMS as it behaves according to the GILT Standard in its communication with other CBMS's is called an Open CBMS or OCBMS.

2 CBMS Services Supported by GILT

The simplest and most basic service of GILT is the sending of a document (e.g. a letter) from one person to another person on another CBMS.

GILT also defines how to transfer documents using distribution lists.

GILT defines concepts which can be used for computer conferences, bulletin boards, journals, newspapers etc. Such concepts are defined by the access rights to them: Who is allowed to write into them, read from them, delete items in them, modify their attributes, etc. .

GILT defines concepts for searching for and retrieval of information in the data base of a CBMS.

GILT defines concepts for the management and control of interconnected CBMS's.

GILT defines concepts for establishing and preserving relations between documents. Examples for such relations are, that one document is a comment or reply to a previous document, that one document is a revision of a previous document, that one document is a part of, or a continuation of a previous document, etc..

GILT defines a scheme for giving each document a globally unique identification. This global identification is used to preserve relations between documents even though they may be transferred at different times and via different routes. This global identification can also be used to ensure that two copies of the same document arriving in a CBMS at different times and via different routes are identified as being one and the same document.

GILT defines facilities for checking whether and ensuring that a document is really delivered to the intended recipient.

GILT allows documents to be distributed in full length, or as an abstract only, or as indication, which contains reference information but not the document itself. In case that the document has not been distributed in full length, GILT offers facilities to the receiving system to retrieve the rest of the document when needed from the originating system.

The GILT facilities for defining conferences and references between documents can be seen as facilities to give a structure to the set of documents in a GILT store.

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GILT has a number of management facilities. Examples of such are the creation of distribution lists, conferences, etc., and the modification of their properties such as the list of the people who have various rights to access them.

GILT also defines facilities to get information about the structure of an accessed CBMS, for example getting lists of or searching for users, distribution lists, conferences.

A very important difference between GILT and most standards for the interconnection of mail systems is that GILT defines standards not only for the distribution of documents on the initiative of the sender (write-mode transmission) but also the distribution of documents on the in- itiative of the reader (read-mode transmission or information retrieval). This means that a document can be retrieved even if it is not stored locally in the system of a user, so that all documents need not be copied to the systems of all who may wish to read the document.

The fact that transmission of documents can be done on the initiative of the receiver rather than the sender, and that GILT provides facilities for structuring the set of documents, will help to overcome problems of information overload which easily occur in large electronic mail systems where the distribution is only controlled by the senders of the documents.

3 Basic Concepts

3.1 The Document Concept

In the GILT model of a CBMS, the data base of the CBMS contains objects called documents. The concept of a document is used to represent documents, manuscripts, texts, letters, conference entries, news items, etc., inside the GILT system. The concept can easily be extended to non-textual information items. A GILT-document can contain a few lines or hundreds of pages. The document-concept is thus in the GILT model used in a wider sense than the normal use of the word document.

A GILT document is structured into a set of attributes describing static properties of the document, that is properties which are not changed during the lifetime of the document. A document can never be changed. If any of the attributes of a document is changed, this creates a new document, possibly with a 'revision-of' reference to the previous document.

The fact that a document can never be changed is important for a mail transfer model, since it means for example that a system which already has a document never has to get a new copy to get the latest version of the document.

A document once created is alive in the GILT system independent from transfers that it undergoes. It is identified by a unique document identification.

3.2 The Mailbox Concept

Documents are brought into the GILT system via mailboxes. Also the mailbox-concept is used in GILT in a wider sense than the normal human use of the word mailbox. A GILT-mailbox is used to represent all kinds of entities which can send, receive and/or store documents. A mailbox can thus represent a human, a computer program, a computer conference, an electronic bulletin board, an electronic journal or newspaper, an organization or a function within an organization, an archive, a job processor, a collection of files. All these are in the GILT model regarded as users.

A GILT mailbox is an addressable object to which documents can be sent or from which documents can be received. A mailbox may also have the property that it can store documents and that documents can be retrieved from it. Although sending respectively receiving of a document can be seen as initiated by the user itself, bypassing the user's mailbox, GILT has chosen the logical view that writing or reading a document is also initiated by the user's system representation, i.e. the mailbox.

Mailboxes may refer to a set of other mailboxes. This is the case for distribution lists, conferences, newspapers, etc., the main purpose of which may be to re-distribute incoming documents to its members. Such mailboxes may be considered as intermediate mailboxes, compared to end mailboxes which do not refer to other mailboxes.

The reference from a mailbox to other mailboxes is done by access rights attributes of the mailbox. These access rights attributes determine which other mailboxes are allowed to read in the mailbox, write into the mailbox and modify other mailbox properties. The access rights attribute may be a list of people or a generic indication such as an indication that 'anyone' is allowed to read documents from a mailbox representing a public bulletin board.

The set of members of a mailbox need not be the same for all access rights. The set of members who are allowed to write into a mailbox, who are allowed to read from it and who are allowed to modify the properties of the mailbox ('organizational' rights to the mailbox), e.g. add or delete members, can be different.

Example: In a mailbox representing a bulletin board, anyone may be allowed to read, only the editors may be allowed to write, and only the boss may be allowed to modify the list of editors. In a mailbox representing a computer conference, one or more chairmen of the conference may have organizational rights to control the mailbox.

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The 'distribution list' attribute of an intermediate mailbox may indicate that documents in the mailbox are to be automatically distributed to certain members of the mailbox. This property serves to model the distribution function of distribution lists, conferences, etc..

Documents are moved between mailboxes. However, sending a document from one mailbox to another one does not mean transmitting the document itself from one place to another, i.e. to delete the document at the sending mailbox. Instead, at least conceptionally, a copy of the document is generated which is passed to the other mailbox so that generally there are several different document instances of the same document in the system.

As mailboxes may originate documents by generating its first instance, mailboxes may as well 'consume' document instances. Mailboxes consuming document instances may model personal mailboxes, mailboxes not consuming document instances or at least keeping them for a very long time may serve to model archives. The document itself exists as long as instances of this document exist.

3.3 The Mailbox Context Concept

Since a document was defined to be a static entity the contents of which is never changed during the lifetime of a document, there is a need for objects storing those attributes of a document which may change. The object is called the mailbox context.

The most important information in the mailbox context is the information which links a document to those mailboxes it is sent to. This information changes whenever a document is copied or retransmitted to further mailboxes. Thus, the mailbox context will contain a kind of transmission history of a document. Several mailbox contexts may exist for the same document, each of them containing only part of the transmission history of the document.

4 The GILT Model of a CBMS

The GILT model describes a structure of the basic elements described above. The GILT model also describes operations which can operate on this structure.

The highest structure level is the GILT_store which represents one CBMS. A GILT_store has global attributes describing properties of this CBMS, such as the subset of operations which this CBMS is capable of handling.

The GILT_store also contains as part of it the document_store and the store_directory. The store_directory is a set of mailboxes, and the document_store is a set of documents.

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A mailbox contains among others an access rights attribute and a distribution list attribute (conceptual list of members) and a set of mailbox_context-objects linking the mailbox to a set of documents.

The document store may contain complete document instances with all information contained i documents, or it may contain two shorter forms of documents, indications which contain attributes like author, creation date, unique identifier, but do not contain the text of the document, and short documents which contain the indication and the abstract.

For a shorter document which does not have any abstract, the short form of the document is identical with the complete document.

GILT services are comunication services providing the means for GILT CBMS's to perform operations on another GILT CBMS. Thus these services can be related to operations within the abstract GILT model. A complete list and description of services and operations is given in the GILT green document.

Here is a summary of the operations defined for GILT:

Select mailbox is the operation of finding and selecting a mailbox at another CBMS for further operations on it.

Write document is an operation (on mailbox level) of writing a document into the store of another CBMS and establishing a relation between the document and a selected mailbox.

Read document is an operation (on mailbox level) to initiate the transfer of a document from a remote, selected mailbox to a local one. The amount of transferred document data can be chosen according to the initiator's intents.

Send document is the operation (on the document store) of sending a document to another CBMS together with a list of receivers. No mailbox related storage is implied but the receiving system will probably try to establish relations between the documents and the mailboxes in the list of receivers.

Retrieve document searches for and identifies one or more documents from the document store of a CBMS for a requesting mailbox at another CBMS. This operation does not itself cause any transfer of retrieved documents to the requesting CBMS.

Get document initiates transmission of document data of documents selected in a previous retrieve document operation. The transmission can contain the full contents of all the documents or only parts of a subset of the retrieved documents.

List CBMS names will return CBMS-names and address information kept by the consulted CBMS.

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List directory and list mailboxes are operations for finding the names of all, some, or one mailbox known to the other CBMS.

Create mailbox creates a new mailbox.

Delete mailbox deletes an existing mailbox.

Update mailbox attribute operations set or update attributes of a mailbox. These operations can be used to add or delete members of a mailbox, alter the type and name of a mailbox, etc..

Read mailbox attribute operations read attribute values of a mailbox.

5 Use of the GILT Services

The GILT Standard does not prescribe how a CBMS has to use the GILT services to operate on another CBMS. This may be done in many different ways. Below are given some examples of how the GILT services may be used by cooperating CBMS's. These examples are included to make the reader understand the possibilities of the GILT model, not to prescribe how GILT is to be used.

When GILT is used for the sending of a document from one mailbox to another mailbox on another CBMS, the full text may be sent, or, for longer documents, only the short document part of it, or only the indication may be sent. If not the complete document is sent, the receiving CBMS may use the retrieve and read operations to get the full text when needed.

GILT-wide computer conferences may be handled in several different ways. When GILT systems which have computer conference capabilities are linked, two or more conferences on different CBMS's can be linked so that every document sent to one of the conferences is copied to all the other conferences, creating a set of parallel conferences.

When a CBMS which does not have computer conference capabilities is linked to another CBMS which does have such facilities, documents sent to a conference at the conference system may be distributed as mail items directly to individual mailboxes at the system which does not have conference capabilities. A document sent to a conference may of course also be distributed directly to a non-conference mailbox at another CBMS even though the other CBMS has conference capabilities. In most cases, however, users will prefer to get documents via conferences, if possible, since this gives the receiver of the document a means of controlling the incoming flow of information.

Parallel conferences, as described above, may be handled in different ways. One way is 'equal-level-cooperation' in which all the conferences on the different CBMS's are members of all the other conferences, all have their own local control of access rights, and a

document entered into one of the CBMS's is redistributed directly from that CBMS to all the other systems where the parallel conference exists.

Another different way of handling parallel conferences is a master-slave strategy, in which one of the conferences is master and the other parallel conferences on other systems are slaves. Using this strategy, the access rights attributes are controlled by the master mailbox for all the conferences. A new document is sent to the master conference, which re-distributes the documents to the slave member conferences.

Archiving and retrieval of documents within the GILT system may be organized so that one or more CBMS's may act as archives for copies of documents. Other systems may connect to these CBMS's at the request of local users and retrieve documents from it as from an information-retrieval system.

Name-server information may be organized so that one CBMS may act as name-server by also keeping lists of mailboxes of some or all other CBMS's. This CBMS may update these lists regularly using the list_directory and list_mailboxes operations.

GILT defines CBMS-CBMS cooperation on system level. This cooperation may be presented to the user in two modes of operation. In the first mode each user request to the local CBMS is directly mapped onto a GILT operation with respective responses from remote so that the user may work as being connected 'on-line' to the remote CBMS. This may be called a 'virtual-user-mode' of operation. In another mode of operation the user first specifies within his local CBMS the complete set of activities he wants to perform at the remote CBMS, and the operation, such as the actual transmission of a document to a receiver on another CBMS, is done at a later time when the user is not any longer waiting for confirmation at the terminal. In the latter case, confirmations may be given to the requestor lateron.

References:

1. The GILT Project - General Overview;
   COST 11bis/GILT/010;
   University of Düsseldorf, Computing Centre, May 1983.

2. The Green Version - Interconnection of Computer-Based
   Message and Conferencing Systems;
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   University of Düsseldorf, Computing Centre, June 1983.

3. The GILT Session Description;
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See also the transcripts of the EUTECO = European Teleinformation Conference, JRC Ispra - Varese, Italy, October 1983.

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Use of GILT facilities in communicating message systems

Examples of computer message systems

Much of the communication in the future world will be through computerized systems. These systems will be used to create, store, organize, distribute, retrieve, and display text items such as letters, papers, news items, abstracts, references, etc. .

Examples of such systems are:

- Distributed electronic mail systems where every user has a work-station for sending and receiving mail through networks.
- Centralized electronic mail systems to which large numbers of users can connect to send and receive mail items.
- Computer conferencing systems in which groups of people can communicate through computer conferences or electronic bulletin boards.
- Electronic publishing systems which may replace part of what is today published in newspapers, books, journals, etc.
- Information retrieval systems storing large data bases of knowledge, where a user can search for information and retrieve items containing specific information.

Many systems have of course facilities for more than one of the alternatives described above. This is the case in most advanced computer conferencing systems, which usually also have advanced mail systems and retrieval systems. Videotex systems also often combine several of the facilities described above and may offer additional facilities like automatic booking of tickets or ordering of goods.

The future world will not contain one large system like this, but a large number of small and large systems. There will then arise a need for interconnection of these systems, so that information can be transferred between them.

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There is today much work on standards for interconnecting different kinds of system. Thus we have the forthcoming CCITT standards for interconnecting pure mail systems. In the videotex area, standards are developed for interconnecting videotex systems. In the information retrieval area, standards are developed for interconnecting information retrieval systems.

This can be dangerous, because there is no sharp limit between mail systems, conference systems, videotex systems and information retrieval systems. In the future, we will probably get more and more systems which can handle many or all of these communication modes. These systems would be easier to interconnect if they could use a standard which is suitable for interconnection of all these kinds of systems.

The GILT standard is a standard for interconnecting mail systems, conference systems and electronic publishing systems. GILT also has some information retrieval facilities defined. GILT thus tries to encompass a wider field than many other standards in the area.

Operations in message-exchange standards

There are several existing standards for connecting computer-based message systems. There are the ARPANET standards, the forthcoming CCITT standards, and the GILT standards.

Most standards except GILT only provides two kinds of operations which one CBMS can perform on another CBMS:

Send-operation, the sending of a message from one CBMS to another CBMS on the initiative of the sending CBMS.

Name-server-operation, an operation for checking if a certain mailbox exists in a certain system, or for finding out the mail-network address of a certain mailbox.

In addition to these operations, GILT provides more operations, for example the following:

Read and Retrieve facilities, that is the sending of messages on the initiative of the reading CBMS.

Create conference to create a conference/mailing list on another CBMS.

Add/delete member to operate on the list of members for a conference or mailing list on another CBMS.

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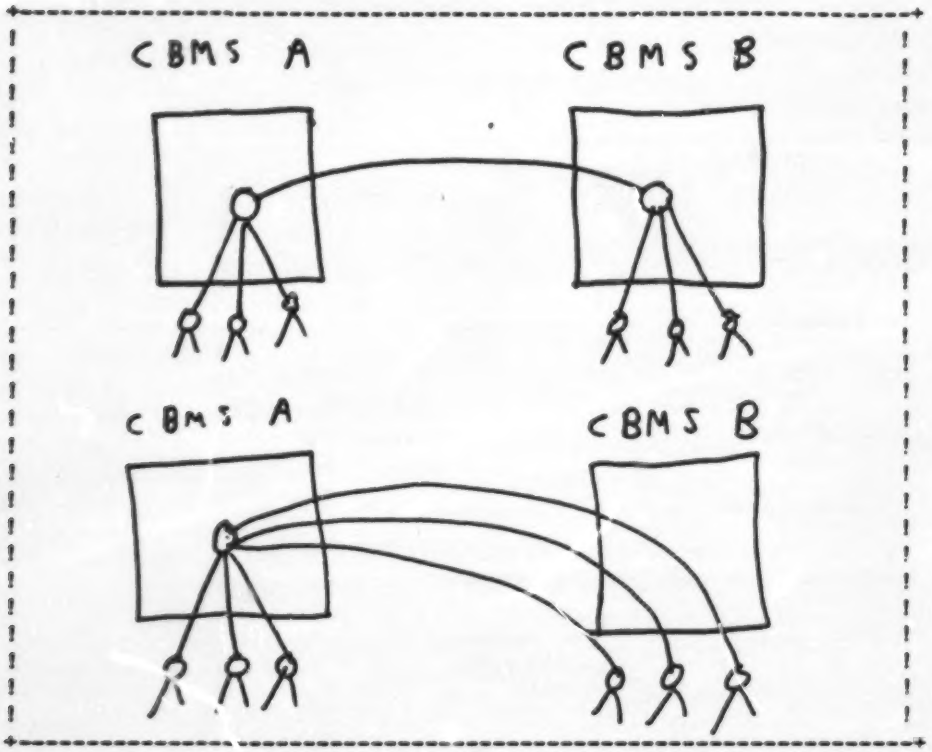
Parallel conferences



GILT thus allows the creation of parallel conferences between one or more CBMS-es. Each entry in the conference is copied to all the parallel conferences in the different CBMS-es. Each member need thus only participate in the copy of the conference in his/her local CBMS.

Example I: A few users at CBMS A are very interested in a special subject area. There is no local conference on that subject. They could then use the list mailboxes GILT operation to find out where such a conference exists on other CBMS-es. Suppose they find that there is a suitable conference on their subject in CBMS B. They would then create a local conference on the same subject, and use the GILT operation set members to add their local conference as a remote member of the conference at the other CBMS.

They could then use the GILT operation list members to find out which other remote CBMS-es already have parallel copies of the conference, and then use the set members operation to add their CBMS also to these conferences.

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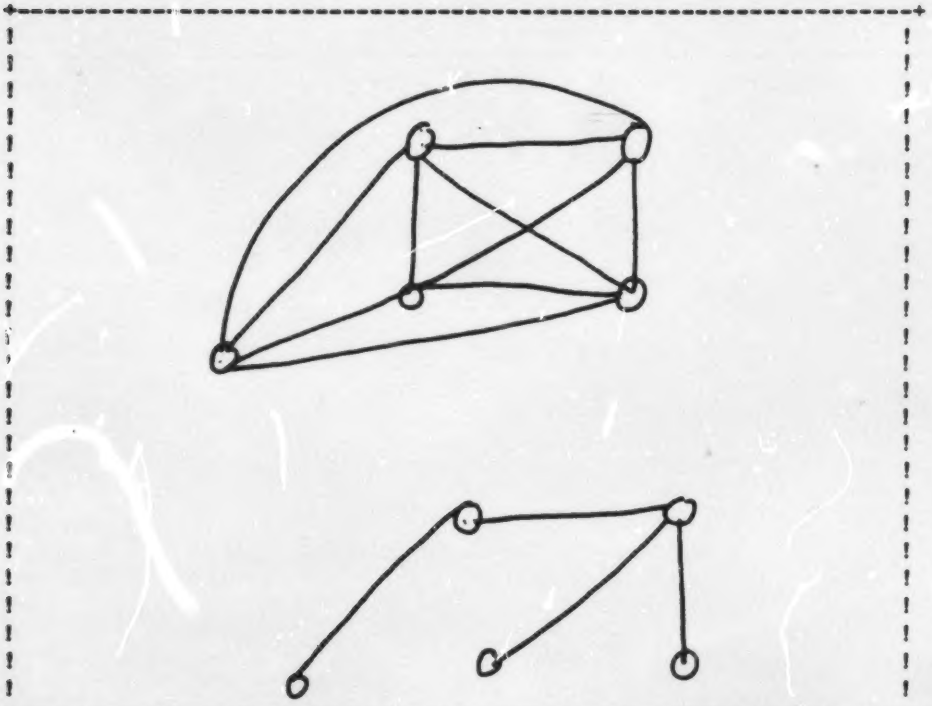
Finally, in order to get their new conference started, they could use the get and retrieve operations to retrieve old entries from an older copy of the same conference.

Example II: A set of parallel conferences could all be set up from one CBMS in ways similar to Example I. Here, the CBMS which creates the set of parallel conferences would use the create conference operation to start conference copies at other CBMS-es. The set member GILT operation would then be used to establish the neccessary links between the conferences so that any message entered into one of them is furthered to the rest.

Star structure or mutual membership structure



The interconnection of many parallel conferences on many CBMS-s can be handled in different ways. One way would be store direct links between all the CBMS-es and their copies of the conference. Whenever a new message is entered, it would then be sent by the originating CBMS to all the other parallel conferences.

Another alternative is to have a star-like structure of links between the parallel conferences where there is only one path directly or indirectly between any two conferences. A message may then have to be forwarded one or more times from the originating CBMS to a certain participting CBMS.

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The advantage with direct connections is that it is faster, and speed is very important since otherwise one person writing a comment to an entry will not know which other people have written comments on the same entry.

The advantage with the star-like structure with relaying is that it is often cheaper and that some CBMS-es cannot connect directly.

GILT supports both alternatives. In the direct alternative, GILT allows one CBMS which creates a new parallel conference to find out which are the other systems to receive direct copies of new entries. GILT also allows a CBMS to include with a message information about which other parallel conferences are getting the message via other routes, so that the message is not sent twice to the same CBMS.

GILT thus will also provide any kind of mixture between direct and indirect transmission of messages between parallel conferences.

Interconnection of small systems

Some personal computers have sophisticated features for connecting to large CBMS-es like computer conference systems. They will then automatically download all new items for their user, and enter any entries their user has written. Examples of such a system is the MIST system (see reference list).

At present, such systems have to use the existing user interface of the CBMS they connect to, and the interface to the CBMS will thus have to be re-written for each CBMS. Instead of this, the GILT standard could be used.

The personal computer could use the GILT send operation to enter items to the large CBMS, and they could use the GILT get, retrieve, and read operations to get all new items for their user. Other GILT operations like list mailboxes could be used when their user needs them.

Thus, GILT is very suitable standard also for this special kind of interconnection between an advanced personal computer and a CBMS.

Electronic publishing

GILT also has facilities useful in electronic publishing applications. The GILT write operation can be used to send abstracts of longer papers to many CBMS-es. The full text is stored in the CBMS maintaining the electronic journal. When someone wants to read a full paper, their CBMS would issue a GILT get operation to the journal CBMS to retrieve the full text. The full text might then be kept for a certain time in the CBMS of the reader, in case someone else wants to read the same paper. But the copy at the reader CBMS can always be deleted if it knows (can be found out via GILT operations) that the paper will be kept for a longer time at the journal CBMS.

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This will save a lot of unnecessary saving and storing of full documents, since many readers only look at the abstracts of papers and do not want to read the full text.

Virtual terminal

GILT can also be used as a kind of virtual terminal protocol. GILT provides standardised ways of performing the operations a user wants to perform on a CBMS. The format of GILT is however suitable for computer-computer communication, not human-computer communication. The user could give his commands to his local computer in human-friendly format, similar to the command structure usually used on that computer. His local computer translates his commands into GILT operations to be performed on another CBMS to which it is directly connected during the whole user session. The results are directly translated back to human-readable format and presented to the user at his terminal.

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2. The Green Version - Interconnection of Computer-Based Message and Conferencing Systems;
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Adding GILT operations to Arpanet and CCITT message transfer standards

This paper discusses how to add the additional functionalities of GILT to other message standards like the ARPANET or CCITT standards. In that way, systems using these standards could get the enhanced functionality of GILT without having to rewrite all their message-interchange software.

This paper is based on the GILT defining documents, and the reader is referred to these papers for a full description of the GILT facilities.

Adding GILT operations to the RFC822 standard

To satisfy user needs when interconnecting advanced CBMS (Computer Based Message Systems) and CBCS (Computer Based Conference Systems) there is a need for more functionality than is provided by the RFC822 standard.

There is a need for facilities to read and retrieve documents on the initiative of the reader (RFC822 only defines the transfer of a document on the initiative of the sender), to create and maintain a set of parallel conferences (one conference on each participating CBCS, all messages transferred automatically between the conferences), to allow a person using a pure mail system to get automatically all messages in certain conferences at remote conference systems, to perform various directory operations etc. (For further information, see the paper "The GILT Approach to CBMS Interconnection".)

One way of realizing these needs would be to switch from the RFC822 to the GILT standard. This solution will however entail high implementation costs for those systems which already have implemented the RFC standards. Also, GILT requires a full X.25 connection, which many systems using the RFC standards may not have available.

This paper therefore proposes that GILT functionality is added as an extension to the RFC822 standard. This paper avoids as much as possible to change the functionality of the GILT standard. The GILT standard has been carefully prepared to meet the enhanced user needs, and it is an obvious advantage to have the same functionality, especially for those who will code gateways between GILT and RFC-based networks or code interfaces to systems which are able to connect to both GILT and RFC-based networks.

Main syntactical structuring

Two main requirements on the syntactical mapping of GILT operations on the RFC standards are:

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a) The GILT operations should be transparent to message-handlers (such as relaying stations) which do not understand the GILT operations.

b) Since the RFC standards are not, as GILT, based on a direct connection between the requesting and serving systems, it is important to be able to map several GILT operations in succession on one RFC message. (Following the GILT rules for grouping of operations using the GILT INVOKE operation.)

Functional differences between GILT and the proposed RFC822-GILT variant.

The main basis of these functional differences is that those functions, which are already defined in the RFC822 standard (together with RFC819 and RFC821) are to be defined as in the RFC standards except when functional enhancements are needed.

Thus, the character set will be ASCII (=ISO 646) and not TELETEX as in GILT.

Sending of documents on the initiative of the sender is done according to the existing RFC821-822 standards.

All transmission of documents, including document headers, with all GILT operations which cause the transmission of a document (send, write, read, get operations) is done in the same format for document headers as in the RFC822 standard.

As a consequence of this, the document attributes will be those defined in RFC822. This could possibly be enhanced by additional GILT document attributes, such as e.g. REVISION-OF:, but coded in an RFC822-like format.

As a consequence of this, the structure of names is that of RFC822, not of GILT. This means that there is no division of the name into "proper_name" and "group_name" as in GILT, and that the @ operator is used to separate the local_mailbox_name from the CBMS_name.

To achieve this, and also to deviate as little as possible from the existing RFC standards, I propose:

1) Sending of messages is done using the ordinary RFC-standards rules for the sending of messages. These could possibly be augmented a little to include additional functionality defined in GILT, such as different types of references between messages, but this is not very important.

2) Other operations than the ordinary sending of messages are done in a format which will look to a relay station, not knowledgeable about GILT, exactly like any normal RFC sending of messages.

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Use of GILT facilities in communicating message systems

To achieve this, I propose that any GILT operation except the SEND DOCUMENT operation are coded as an ordinary RFC message using the RFC fields in the following way:

FROM: Indicates the requestor of the operation. This can be either a local user, or, for reguests initiated automatically by the local CBMS/CBCS, the pre-defined mailbox "GILT-SERVER". All requests performed on the initiative of a local user should have his/her name in the FROM field.

DATE: Normal RFC usage of this field.

RETURN-PATH: Normal RFC usage.

REPLY-TO: Can be the name of the user, if the result is to be sent unmodified to him/her, or "GILT-SERVER", if the result is to be handled by the GILT-server program (and, perhaps, after transformation, given to the user) or both.

SENDER: Should always be the GILT-server at the requesting side (e.g. "GILT-SERVER @ EDUCOM").

TO: Should always be the GILT-server at the serving side.

MESSAGE-ID: Must always be included, serves as transaction-id.

IN-REPLY-TO: Must include the message-id of a previous transaction when sending from the server the result of the transaction to the requester.

The GILT operation(s) are then coded into the textual body of the transferred message, which to a relaying agent not knowledgeable about GILT will just look like ordinary message text.

The GILT operation(s) will thus be preceded by a blank line. Every GILT operation should begin with the text "!OPERATION:". If several GILT operations are coded into one RFC message, then each must be preceded by a blank line and begin with the text "!OPERATION:". Blank lines followed by this text may not occur in the GILT operation(s) portion except to indicate the beginning of a new GILT operation.

Coding of GILT operations

GILT operations and their results are coded using as much as possible the normal RFC syntax rules.

Results

The results of GILT operations are sent back as separate RFC messages from the server to the requestor, but with an IN-REPLY-TO reference to the message containing the operation(s) whose results are sent.

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Results also look like ordinary RFC messages to a non-GILT-knowledgeable relayer.

If one letter with GILT operation requests contains a block of several GILT operations in succession, then the result will contain all the results to all the GILT operations in one single answering letter. However, if one of the GILT operations fails, rendering the rest of the operations invalid, the result need not contain the results of the operations after the failing operation.

Each new result begins with a blank line followed by a line which begins with the text "!RESULT:". Even operations which will not give any result at all will create an empty result paragraph in the resulting message with just "!RESULT:<operation name>" and nothing else on a line surrounded by blank lines.

Examples of GILT operations and results

Checking for the existence of a certain mailbox or set of mailboxes

One CBMS may have received second-hand information that one or more mailboxes with certain names exist at another CBMS. To validate this information, the GILT operation LIST_MAILBOXES may be used.

Example 1:

```
!OPERATION: LIST_MAILBOXES
REQUESTOR: GILT_SERVER
NAME_PATTERNS: "John Sm", "Peter Sm"
```

The Above GILT operation could get the following result:

```
!RESULT: LIST_MAILBOXES
MAILBOXES: "John Smith", "John Smythe", "John Smythe", "Peter Smith"
```

A negative result on the same operation might look like this:

```
!RESULT: LIST_MAILBOXES
REJECT:
REASON: OBJECT_NOT_EXISTING
```

Example 2:

In this example, we want a list of those conferences at the serving CBMS where the requesting mailbox can make itself a member (that is, conferences which are open, public, for the requesting mailbox).

```
!OPERATION: LIST_MAILBOXES
REQUESTOR: "Mary Finch"
RESTRICTION:
DISTRIBUTION_LIST: RESTRICTED, FREE
!RESULT: LIST_MAILBOXES
MAILBOXES: "Announcement of public conferences",
           "Speakers Corner",
           "Computer Networks"
```

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Finding out more about a certain remote mailbox

This can be done using the SELECT_MAILBOX operation. Since this will be a common operation, the result is partly coded as a string of 1-s and 0-s to reduce its size:

```
!OPERATION: SELECT_MAILBOX
NAME: "Mary Peters"

!RESULT: SELECT_MAILBOX
SELECTED:
ONTO: "Mary Bilderman"
WHY: CHANGED
CAPABILITIES:
ACCEPTANCE_MODE: COMPLETE
MEMORY_MODE: 30
OPERATIONS:
ATTRIBUTE: 10001011010
TRANSFER: 1000
```

There are other GILT operations to find out more about a certain mailbox. Most of these must be preceded by the SELECT_MAILBOX operation. For example, the description of an open conference can be read in the following way:

```
!OPERATION: SELECT_MAILBOX
NAME: "Pascal experience"

!OPERATION: READ_MAILBOX_DESCRIPTION
REQUESTOR: GILT-SERVER
```

Which might return the following results:

```
!RESULT: SELECT_MAILBOX
SELECTED:
ONTO:"Pascal Experience"
WHY: IDENTICAL
CAPABILITIES
ACCEPTANCE_MODE: COMPLETE
MEMORY_MODE: 120
OPERATIONS:
ATTRIBUTE: 10001011010
TRANSFER: 1111

!RESULT: READ_MAILBOX_DESCRIPTION
This conference is open for anyone who wants to discuss the uses of
and experience with the Pascal programming language.
```

After SELECT_MAILBOX could also follow other read-operations such as:

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```
!OPERATION: READ_MAILBOX_STATISTICS
REQUESTOR: GILT_SERVER

!OPERATION: LIST MEMBERS
REQUESTOR: GILT_SERVER
```

with the results

```
!RESULT: READ_MAILBOX_STATISTICS
Number of members: 37
Number of entries: 156
Last entry date: 15 Sep 1983 0932 GMT

!RESULT: LIST_MEMBERS
NAME: "Jacob Palme":QZ @ ODEN.MAILNET
MODE:COMPLETE NAME:
"IAN Service" @ YORKCOM.JNT-MAIL
MODE:COMPLETE
NAME: "PASCAL Experience" @ CHICAGOCOM.MAILNET
MODE: COMPLETE
...
```

Creating parallel conferences

Suppose a person John Johnsen who is a registered user of the COM system at the university of Chicago has heard that there is a conference about Pascal in the COM system at ODEN. John Johnsen wants to establish a parallel copy of this conference in the COM system at Chicago.

John Johnsen would then first perform a LIST_MAILBOXES operation to find out the full name of the conference. The result would tell him that the name is "PASCAL Experience". John Johnsen would next create a conference with the same name in the COM system at the university of Chicago and make the conference in Stockholm into a member of the conference in Chicago.

Next, he would get a list of the members of the conference in Stockholm, and find that an EIES conference on the same subject was a member there. He would then make the EIES conference also into a member of the conference in Chicago, so that entries from Chicago could be sent directly to EIES via the MAILNET hub and need not go indirectly via the COM system in Stockholm on ODEN.

Finally, he would perform a SET_MEMBERS operation on the COM system in Stockholm to make the conference in Chicago into a member there, so that all future entries in Stockholm will be sent to the conference in the COM system in Chicago. This operation might look like this:

```
!OPERATION: SET_MEMBERS
REQUESTOR: "PASCAL experience"
NAME: "Pascal experience" @ CHICAGOCOM
MODE: COMPLETE
```

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with the result

```
!RESULT: SET_MEMBERS
NAME: "PASCAL experience" @ CHICAGOCOM
MODE: COMPLETE
```

After this, John Johnsen would like to get the conference in Chicago started by transferring to it all entries in the conference in Stockholm written after a certain date, e.g. 15 Jul 1983. This is done using the RETRIEVE_DOCUMENTS and GET_DOCUMENTS operations:

```
!OPERATION: RETRIEVE_DOCUMENTS
REQUESTOR: "Pascal Experience"
CLAUSE: >
OPERAND_1: ORIGINATED
OPERAND_2: 15 Jul 1983

!OPERATION: GET_DOCUMENTS
REQUESTOR: "Pascal Experience"
READ_SPECIFICATION: 999999
READ_MODE: COMPLETE
```

giving the results:

```
!RESULT: RETRIEVE_DOCUMENTS
SCORE: 23
!RESULT: GET_DOCUMENTS

!RESULT: GET_DOCUMENTS
MODE: COMPLETE
RFC822: ... Here follows the document  in RFC822 format ...
MODE: COMPLETE
RFC822: ... The next document in RFC822 format ...
... etc ... list of 23 documents
```

Question: How shall we separate several documents in a list of this kind, when the RFC822 standard allows any character combination in text. Perhaps a new !-operator is needed, !TEXT, so that the result would be

```
!RESULT: GET_DOCUMENTS
!TEXT:
MODE: COMPLETE
RFC822:
... RFC822 formatted document including headers
!TEXT:
MODE: COMPLETE
... etc ...
```


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A coding convention

Since the sequences "!OPERATION:", "!RESULT:" and "!TEXT:" may occur in a transferred text, these sequences will then be coded as "!!OPERATION:", "!!RESULT" and "!!TEXT:" respectively. To avoid ambiguity, I suggest that any occurence of "!" first in a line is coded as "!!" except when the "!" is the beginning of one of the predefined sequences. "!OPERATION:", "!RESULT:" and "!TEXT:".

Adding GILT facilities to CCITT standards

Adding GILT facilities to the CCITT standards is more difficult than adding GILT facilities to the ARPANET mail-transfer standards. The reason for this is that the ARPANET standards are standards for the interconnection of CBMS-es, while the CCITT standards are standards for interconnecting mailboxes (called User Agents in the CCITT standard).

Probably the best solution is to regard a computer conference, bulletin board, electronic journal, distribution list etc. as a special kind of User Agent which might be called Distributing User Agent. This User Agent will then have different facilities than ordinary User Agent:

> Messages sent to a Distributing User Agent are forwarded by it to certain other User Agents, which can be new Distributing User Agents or ordinary User Agents.

> A Distributing User Agent can be able to receive specially formatted messages asking it to send out items from its storage, similar to the GILT get, read and retrieve operations.

> GILT operations like set member may be used by sending specially formatted messages to Distributing User Agents.

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